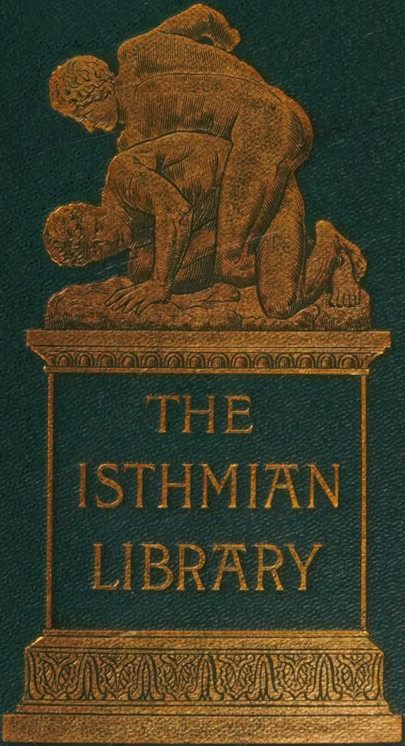
THE COMPLETE CYCLIST



UNIVERSITY COLLEGE LIBRARY
NOTTINGHAM

Class Mark S GV 1041 P4

Book Number 75276

PRESENTED TO THE
LIBRARY OF
UNIVERSITY COLLEGE
NOTTINGHAM

[redacted]

UNIVERSITY OF NOTTINGHAM
WITHDRAWN
FROM THE LIBRARY

TELEPEN
6 00 158496 8

WITHDRAWN
FROM THE LIBRARY

DATE DUE FOR RETURN

I·L·L
JZ47335
26·4·93
+ 3 wks
Lib· use·
only.

This book may be recalled before the above date

90014

A Morning in Battersea Park.

The Isthmian Library, No. 2.

THE
COMPLETE CYCLIST

BY

A. C. PEMBERTON
(Of Rickmansworth),
MRS. HARCOURT WILLIAMSON,
C. P. SISLEY, AND GILBERT FLOYD.

ILLUSTRATED

Edited by B. Fletcher Robinson

LONDON
A. D. INNES & CO.
BEDFORD STREET
1897

UNIVERSITY COLLEGE LIBRARY · NOTTINGHAM ·
2 SP

Digitized by the Internet Archive
in 2024

https://archive.org/details/completecyclist0000unse

CONTENTS.

CHAPTER PAGE
I. Of Cycles and Cycling 13
II. The Cycle in Society. *By* Mrs. F. Harcourt Williamson 47
III. On the Choice of a Machine 63
IV. On the Choice of a Machine—*continued* ... 95
V. How to keep a Machine in Good Order ... 132
VI. The Humours of Cycling. *By* Gilbert Floyd 155
VII. On Pneumatic Tyres and the Methods of Repairing them 181
VIII. How to Ride 204
IX. On Touring and the Tourist's Outfit ... 227
X. Rides round London. *By* C. P. Sisley ... 245
XI. On Racing and Training 275
XII. On Clubs, Cycling Institutions, and Literature devoted to the Sport 309
XIII. On Tandems, Multicycles, Machines of Peculiar Design, and Motor Cycles 322
XIV. How to build a Bicycle 344

THE COMPLETE CYCLIST.

CHAPTER I.

OF CYCLES AND CYCLING.

FROM the time of primitive man, dwelling in holes dug out of the most convenient bank, the speed of the lower animals and the swiftness of the birds have been an object of envy to him. All have at some time experienced a longing to be able to compass space with less exertion and at a greater speed than is possible by foot power, unaided by any modern mechanical appliances. During long centuries the only European improvement on pedestrianism was the horse, the most rapid of beasts of burden. During the Middle Ages many attempts were made, as now, to follow the example of the birds, and to fly; but aerial navigation has to rank as unattained, excepting so far as it can be accomplished by ballooning, which is now almost exactly in the same state as when Montgolfier made his first ascent in a fire-balloon. The aeronaut has to drift entirely at the mercy of the elements, like a log on the ocean, without any means of determining his course.

The fact that it is very much easier to roll his own weight than to carry it, only dawned upon man many centuries after he had made use of the same means for lightening the work of his beasts of burden. Then, about the end of last century, the earliest velocipedes were constructed and used in France, and a few years later became, in a small degree, popular in this country.

The machine—which is, doubtless, familiar to most readers, from illustrations reproduced from prints of the period, as the "hobby-horse"—was a contrivance much after the pattern of the original boneshaker, with a pad for the rider's chest, and a handle in front to steer by. It was propelled by the action of the toes upon the ground. The rider struck out alternately with each foot, in a manner somewhat akin to skating; the impetus obtained enabling him to cover a considerable distance at each stroke. The exact speed of the machine of this time is lost in obscurity; but such a vehicle would without doubt enable any one to accomplish a greater distance than he could have traversed on foot without it. Old engravings exist showing riders escaping from the plague of the period, the "bum bailiff;" old and perspiring gentlemen are represented taking their families out for a trip on a multicycle, propelled in the same manner. Whether the latter vehicle existed is a matter for conjecture; but if it did, the task of driving one must have been such that a heavily laden carrier tricycle would have been child's play compared with it.

After the boom in the hobby-horse had died out, such methods of progression appear to have faded from the public mind for nearly fifty years—a fact, no doubt, partially due to the advent of the railways. The condition of the main roads had something to do with the matter. Certainly, from all accounts, those existing in this country prior to the time of McAdam and other pioneers of highway construction, were in such a dreadful state that cycling, excepting on the best of them and under the most favourable conditions, would have been almost out of the question for anything not constructed with pneumatic tyres. Even with these, a modern field track would have been preferable, as the ruts were so deep that, once in them, the cyclist would have had to continue his course until he either dismounted from necessity, or was spilt over one of the large unbroken stones with which the king's highway at that time was constructed. Sad indeed was the condition of the neglected highways of some hundred years ago.

The improvement of the cycle dates from about the time of the great Exhibition of '51; but it did not make much headway in England until after it had been in use in Scotland, as a crank-driven vehicle, for many years. A certain Gavin Dalzell invented, for his own use, a greatly improved form of velocipede, which contained the germ of all that, so far, has gone to make a success of the modern machine—the utilization of the principle of crank-driving, as opposed to the earlier method adopted in the hobby-horse. Whether

Dalzell was the first inventor of this great improvement is somewhat uncertain, as claims have been advanced for its earlier use by another Scotsman; but there is little doubt that to one or other of the canny Scots the credit must be given. I own that to me it is a matter of surprise that Scotland did not foresee earlier in the day the extent to which the industry would grow, and, with all the engineering facilities at her command, rival Birmingham and Coventry in supplying the demand.

So soon as the invention of the crank, as applied to bicycles, became known in England—a process that took ten or a dozen years—machines were constructed in London, and shown at the Exhibition of 1861. It is believed that from this exhibition the French got their ideas for constructing the bicycles which shortly afterwards became popular in Paris. Certainly the original machine, adapted as a model by the oldest firm in the trade—the Coventry Machinist Co.—was imported from Paris.

Under the clever management then controlling these works, the bicycle, which at first was regarded as more or less of a toy, soon proved to have claims as an instrument of utility, and other firms were not long in entering into competition with the introducers. My first recollections take me back to the days of the boneshaker, when iron tyres and wooden wheels were the usual method of construction. At this time the bicycle had two wheels of equal size, of about thirty-six inches in diameter, with a solid iron frame, and a saddle midway between the wheels. Crude as it was, it would, nevertheless, cover about seven or eight miles an hour, and a good rider could do his fifty miles a day. Mr. John Butler rode to Oxford on a machine of this class in the respectable time of eight hours, or about as fast as a first-class pedestrian would do the distance.

The next improvement in the machine was the substitution of indiarubber for the iron in the tyres. Many wooden-wheeled boneshakers were built with tyres of this description, made from the best rubber, of a quality that is not often found in the modern cushion tyres, and fully as thick. Soon steel began to displace wood for the wheels, and the Spider and Ariel machines were forerunners of the modern style of construction, with wire spokes, iron felloes, and handle-bars. Wood had been banished for a time, but is now beginning again to prove advantageous in some parts of machine construction.

During the course of these improvements the size of the front wheel—always the driver—had gradually grown, until, about 1876, it nearly reached the maximum, many machines being fifty-two and fifty-four inches in height. Sixty was always a tall machine, and, although larger machines may have been made, the highest I have ever come across was a sixty-four, built for a Mr. Hebblethwaite.

The back wheel diminished in size as the front grew, until it eventually settled down at about seventeen or eighteen inches. Smaller sizes were tried, and found to cause too much vibration. The ambition of riders about the time when the Ordinary bicycle was at its best, was to obtain as tall a machine as they could stretch, and have a very small back wheel. One rider advocated, in the *Bicycle News* of the time, a six-inch hind wheel made from indiarubber. About 1878, anti-friction roller bearings were applied to bicycles; they had long been in use for ships' blocks and other mechanical purposes, where a lessening of friction was essential. Owing to the rollers not always running true, they were shortly superseded by ball bearings originally constructed with two rows of balls in a double groove, with a case similar to that employed by engineers for their plummer blocks. This pattern was destined to be entirely superseded by those in which the principle of lateral adjustment was utilized. Invented by Hughes in 1878, and introduced by W. Bown, of Birmingham, the pattern was universally adopted, and the proprietor of the patent for a number of years made a very large sum out of his royalties and his patent rights, which practically covered the only means of making a perfect bearing. This method of construction is to be found on all modern machines.

The Ordinary bicycle may be said to have reached perfection about 1879, and for the remainder of its career the changes it underwent were of the nature of alterations, which in many cases did not add to its stability or usefulness as a roadster. A slight increase of speed for racing purposes and increased wearing qualities were, however, obtained. In the construction of the Ordinary, the makers passed their apprenticeship, and mastered the art of building a machine which would stand wear and tear, and at the same time be of sufficiently light construction to enable a high speed to be maintained.

To mount an Ordinary was a task that few elderly men attempted; and when mounted, the danger of headers and the skill required to master the machine properly were such that many riders, wanting in activity and nerve, soon gave it up. There was a demand for something which would combine with safety the delights of the tall machine. The early attempts in this direction were confined to the tricycle—at first a cumbersome machine, weighing about one and a half hundred-weight, but soon reduced to more manageable proportions. The original tricycle, which first came to my notice as a practicable vehicle, was the "Coventry Rotary," a machine driven by levers swinging from a fulcrum behind the pedals, and connected with the crank-shaft by rods; the arrangement of the wheels was so contrived that a large one (the driver) was placed alongside the rider, and two smaller ones were fixed at the end of a long stay, one in advance and the other behind the rider, on the opposite side. All the early tricycles were constructed with levers for the pedal motion, although the arrangements of the wheels were different. Singer introduced a peculiar pattern, with a large driving-wheel behind the rider. In fact, the first rear-driven bicycle he built was on the same plan—a machine used and approved at the time by the ex-Chancellor of the Exchequer, Mr. Lowe.

None of these machines could be called real successes, and it fell to Mr. James Starley, of Coventry, to introduce chain-driving for tricycles, and make a success of them. His earliest machine, the "Salvo," was the pattern on which all modern tricycles have been constructed. He added that most essential improvement, the balance-gear, enabling both wheels to be equally driven, and permitting the differential movement necessary for steering purposes and turning corners. Soon chain-driven machines superseded the lever entirely. Many machines destined to become failures came upon the market, became popular for a time, and died out. One typical of these, the "rear-steerer," may be mentioned. Then followed the Humber tricycle, originally in the form of two sixty-inch wheels, driven by a pedal action and chain, with a small wheel behind the rider, the large wheels being steered with a bicycle handle. This was superseded by the automatic-steering machine, introduced by the same firm, and built much on the same principle as Starley's original "Salvo," though improved in detail and with bicycle steering. This latter is now the only pattern for modern tricycles, though the automatic steering has disappeared, and many minor improvements have been introduced.

With the tricycle, the necessity for an improved chain became evident, and makers became initiated into the method of its construction, without which the Safety of to-day would be but a poor contrivance. The early chains were those made for, and sold to, manufacturers of lawn-mowers. The imperfections of this cumbersome and heavy stuff were soon discovered, and cycle-chain was specially manufactured. Year by year it has been improved, until we now get chains claiming to give out more power than is applied to them! Certainly the modern 3-16 racing chain, with a breaking strain of about one ton, and with hardened blocks and rivets, is a masterpiece of commercial engineering work.

The safety of the tricycle made many yearn for a machine which would combine its comfort, and at the same time allow them to keep pace with the Ordinary bicycle. As mentioned above, the first attempt of this kind was made by Singer with his lever-driven, rear-driving bicycle. Then followed a miniature Ordinary bicycle, with swinging cranks, made by the Coventry Machinists Co., and called the "Pony"—a machine with many faults, but of undoubted utility, and ridden from choice by such men as Freeth and McCullum Hill, well-known amateur cyclists at a time when amateurs were really such, and not professionals in disguise. The limited success of the "Pony" soon brought forth the "Facile," which was popularized by Mr. Boothrood, the inventor of the single-tube tyre. This was a lever-driven machine, and soon proved that it made up for its small driving-wheel by the greater ease with which the rider could pedal; for road-work it became a popular favourite, and many long rides were accomplished on it. It nearly equalled the speed of the Ordinary, and for a day's work over trying country was but little behind. It held its ground until displaced by the rear-driver.

Simultaneously with the increasing popularity

Tempora Mutantur.

of the "Facile," the first chain-driven safety made its appearance—the "Kangaroo," of the Premier company of Coventry. This was built on the lines of a small Ordinary, with forks prolonged below the axle. These forks carried on either side a pedal on a short supplementary axle, with a gear-wheel connected, by a chain on each side, with a smaller gear on the axle of the machine. Aided by one or two record performances, obtained by subsidizing the best-known riders of the day over a particularly favourable course, this machine flashed into public notice like a meteor, and every firm of note began to copy the original, as it was not patented. Although perfect in theory, it had many practical disadvantages. Had not the rear-driver appeared on the scene, the "Kangaroo" type would, perhaps, have been improved, and might have rivalled the Ordinary; but about this time the machine, which was the prototype of the only one now in general use, made its appearance. Starley, of Coventry, reinvented the rear-driven Safety. Mr. Lawson, a late *employé* of the Coventry Tricycle Co., was the first inventor of this form of machine, which was exhibited in the company's London showroom in

Queen Victoria Street about 1880. But, like many other good things, such as the pneumatic tyre, it was before its time, and the public would have none of it. Had the inventor known how to exploit it by modern means, and had he possessed the cash for the purpose, he might have amassed a gigantic fortune. As it was, he allowed the patent to drop, and the fame and kudos of its reappearance fell to the lot of the old Coventry firm.

The earliest appearance of the modern rear-driver was in the form of an advertisement of a very cumbersome and peculiar machine, christened by its manufacturers the "Rover." Riders at first laughed at it; but soon paragraphs began to appear in the cycle press upon its capabilities. Soon it began to assume a more attractive appearance; the link steering gave way to a direct handle-bar on the forks; other firms began to copy it—the surest sign of success. Almost at once we found it holding its own upon the roads. Its advantage over the Ordinary and any other machine on a hill was discovered. This discovery, coupled with the fact that it was nearly, if not quite, as fast as the Ordinary on the level, caused riders who had scorned anything but the fastest machine extant to give it some attention; and to those who could see ahead, it soon became apparent that at last the old Ordinary had a serious rival. The worst point of the Safety in its early days was, that it was a poor bad-weather machine. The chain was not protected, and clogged with mud; the frame was springy, and warped out of line when hard driven, causing the machine to run very heavily; owing to the feet being so near the ground, the rider soon found his boots or shoes full of water and mud. Some of these faults have been entirely obliterated; but the latter remains as the Safety's greatest disadvantage.

Directly the Safety bicycle was fairly established, what in those days was considered a wonderful performance carried it at one bound into first place as a road machine. G. P. Mills covered 295 miles in twenty-four hours—over sixty miles more than had ever before been accomplished in the same time. This remarkable feat took the whole cycling world by storm, and at once settled any doubts as to what was to be the type of the machine of the future. Old Ordinary riders gave up the mount which had served them so well during a couple of decades, and although a vain attempt was made by a few fanatics to stem the tide by establishing a "safety bar" in races, the "geared-up penny," as it was facetiously dubbed, steadily gained in the estimation of the riding public. Men who had given up the Ordinary on account of its danger, returned to the sport, and tricycle riders soon saw that in continuing to use their old mounts they were simply incurring needless labour. The design of the machine was improved, and from the original weak pattern known as the cross frame, the diamond frame, which is now almost universal, was evolved. The main credit for this improvement must be given to the makers of the "Referee," a young firm, of which the chief partners were barely in their twenties. Humber and two or three other firms had constructed machines lacking only the diagonal stay which is needed to convert the original "Rover" pattern from a mechanically imperfect piece of engineering, to one eminently calculated to stand any strain put upon it inside the load it is designed to carry. The addition of the air tyre, and a general refinement of detail, was all that was required to bring this machine up to modern ideas.

Like certain South American States, the cycling world has been destined to experience numerous revolutions, all of which have fallen heavily upon the manufacturer, and in some cases caused him serious loss. Tons upon tons of material have been constructed only to become obsolete as soon as made.

The advent of the pneumatic tyre is due to the genius of a Mr. Dunlop, a retired veterinary surgeon in Ireland. Not that the idea was absolutely new, for it had been patented by a Mr. William Thompson, a coach-builder, in 1846, and used with a certain amount of success for some years; but it did not catch the public taste of the time, and was forgotten until unearthed among the patent office records by diligent searchers directly the success of the invention was assured. A comparison of the original specification of both inventors is instructing, as showing how two men unknown to each other may work on identically similar lines—the one to be disheartened by failure, and the other to reap a gigantic fortune.

For nearly a couple of years the new tyre was in use in Ireland, and winning races in the hands of the Ducros, who had purchased one of the original machines before any notice of it was taken here. Then it appeared suddenly in the spring races of the Surrey Club at the Oval, and simply carried everything before it. One machine, the property of the "Referee" company, was lent to riders in several heats, and in each case it won by "streets," to use racing phraseology. The public rushed to buy the new tyre, and had to wait several months to obtain it. The cycle-makers did their best to decry it, and only supplied it under protest, for it meant that the large stock of component parts in their stores would be to a great extent useless; but their efforts were in vain.

The original Dunlop tyre was a very crude article, and of fearful and wonderful construction. To remove a portion of the air-tube for repair was half a day's work; even then this required more skill than most amateurs possessed, besides being a most messy business. The outer cover consisted of rubber fixed with solution on to canvas, which was in turn fixed in a similar manner on to the rim. The air-tube was contained in a canvas bag. This had to be cut before the rider could get at a puncture, while the joint of the air-tube had to be taken apart before it could be got out for repair. This process had to be reversed, and a long time spent while the cement was setting before the rider could resume his journey. Fortunately these tyres were made of thick rubber of very fine quality, and punctures were not frequent, many being completely worn out without such a mishap occurring. For myself, I rode about twenty thousand miles on tyres of this description; only once had I occasion to go through the performance, and before it was half completed I gave it up in disgust, wrapped the remains of my handkerchief, torn into strips, round the damaged spot, and rode home, thinking myself lucky that the tyre would hold air.

The application of the air-tyre to the Safety with such marked improvements induced makers to try it on the almost defunct Ordinary; but for some reason—possibly the extra weight—it did not equal expectation. However, it was found that a machine constructed upon the same lines as the Ordinary, with smaller wheels, geared up by an internal gear concealed in the hub of the front wheel, was a great improvement upon the original, and a bicycle of this class was vigorously pushed by its designers and makers, the Crypto Works Co., of which Mr. Boothroyd was at the head. Aided by several good performances, including the twenty-four hours' record by Shorland, and backed up in the press by the same riders who had attacked the rear-driver on its introduction, it had a small boom, and for a time it appeared possible that it would be a serious rival to the then standard pattern rear-driving machine. However, from personal experience, I soon discovered for myself that its merits were much overrated. It had all the disadvantages of the old Ordinary, added to a few more of its own. Doubtless on this account it soon became neglected, and to-day only survives in a very much improved form, with greatly reduced wheels, known as the "Bantam." Owing to its small size and light weight, it is *par excellence* the machine for old gentlemen, many of whom speak most enthusiastically of it. The "Bantam" and the rear-driver may be said to be the only types now existing, with the exception of the carrier tricycle, although it is more than probable that the tricycle will again reappear.

Having given my readers a slight insight into the rise and progress of the cycle, its present aspect and possibilities are such that the subject cannot be dismissed without further consideration. A machine which by economy of labour will enable man to cover, not twice, but four times the distance he could have covered before in the same space of time with the same exertion, is bound to make its presence felt in all stages of life—industrial, social, and even martial. Strange as the problem seems, for nearly twenty years the cycle had been among us in daily use, with its immense capabilities fully proved, before the general public realized its powers. The riders were in the minority, and society refused to look upon it with the slightest favour. It was not until the year 1895 that cycling became fashionable as well as popular. Then ladies began to take it up, and the depôts of the large manufacturers on Holborn Viaduct were choked by crowds of "smart" people, all anxious to secure machines. Trade waxed fat for the manufacturers, who managed to cope with the increasing demand and to secure large profits for themselves; but the actual demand that was to follow during 1896 surpassed the wildest dreams of the most sordid owner of cycling plant.

The year began well for the trade; the usual dull season at the end of 1895 almost failed to appear, and the usual hours were continued in most factories. Manufacturers expected a good time, and made largely for stock; but at the annual shows held in December by the Stanley Club and the Association of Manufacturers the business done exceeded all expectations. Contracts were concluded on a larger scale than ever before, and for the first time American machines appeared. As the season advanced, the number of orders increased to such an extent that before Easter, which in previous years had been the beginning of the season, many of the largest makers were hopelessly oversold. Still the orders flowed in, and before Whitsuntide a cycle could not be promised by the best makers under months. Some firms at this time closed their order-books altogether, except for indefinite delivery. Agents spent their time dodging about from factory to factory, hoping by offers of ready cash to get hold of something, and thinking themselves lucky if they managed to come home with one or two machines out of the many dozen they had on order. Steel tubes were at famine prices; makers found themselves short of all the components which they did not themselves manufacture. Saddles, gear-cases, and all the small things necessary for cycle construction could not be had in sufficient quantities, and necessarily the prices advanced rapidly. Tales are told of men wandering round London seeking for machines, and only finding them at a premium of something like 40 per cent. over the usual price. In the Midlands, masters and workmen deserted trades they had followed all their lives to become either manufacturers or to be employed in the industry. Brass-workers, gunmakers, locksmiths, and engineers were all tempted to share in the wealth to be found in the cycle trade. In fact, any one who could use a file or who had a knowledge of lathe work was snapped up. The natural consequence of this was that the quality of work fell off, and that many machines left the factories which in ordinary times would not have been allowed to pass the viewers. Working, as many factories did for months, with one shift up to ten every evening, it was only human to expect that the previous good quality of the machines built should fall off.

All this activity meant, of course, greatly increased profits to the proprietors of the factories.

and when these were in the hands of limited liability companies, the shares advanced in price. The lead was set by the great Dunlop company, which was floated for a sum of four millions sterling; and any one who had a business to sell became anxious to float it, and convert some of the greatly increased profits into capital. Every one seems to have overlooked the fact that these calculations were based on the phenomenal results of 1896 only. Options for purchase of businesses were eagerly sought after, and when put upon the market, the public swallowed anything connected with the trade with avidity. The consequence of this was that many rotten concerns were floated which had previously been on the verge of bankruptcy, and old and obsolete plants were dressed up by a well-drafted prospectus as of modern construction, and unequalled for their work. The Stock Exchanges in London and Birmingham—always ready to gamble in anything out of which money can be made—assisted the movement, and big premiums were offered for shares. Men who had risen from nothing became possessed of handsome fortunes; it was difficult to find any one, with connections in the manufacturing districts, and in possession of capital, who had not an interest in some of the companies being floated.

In spite of the great amount of money invested, the vitality of the trade has been such that up to the time of writing the long-expected "slump" has not arrived. Those concerns which had any real merit in them have very fairly maintained their quotations, in spite of the fact that in some cases the rise in values has been at the rate of hundreds per cent. A tale is told of one fortunate man who invested the munificent sum of 15*s.* in the shares of the New Beeston Tyre Co. at 3*d.* each, and afterwards sold out at over £8 per share, realizing about £489 by the deal. Another poor fellow, who had laid out a large sum in the shares of this company at par, disposed of them for 9*d.* each a few days before the rise took place. As the company has done well, the increase in the price appears sound; but it shows to what an extent the trade has grown when it is remembered that, before the boom, this concern was considered on its last legs.

America appears to have been before us in having its boom, and, when the tales of the prosperity of the trade in England reached that country, the manufacturers who had found themselves overstocked were not slow to take advantage of a market already made for their wares. As is the custom with the Yanks, they did not do the thing by halves. Depôts were taken in London in the best and most expensive situations, and money was spent freely in advertising in more original and attractive methods than had been the custom with English cycle makers, who had from long security grown to imagine that their manufactures were of such unimpeachable quality that nothing could jeopardize their position as makers to the whole world. At first they pooh-poohed the fact that any one would have the audacity to compete with them on their own ground. Then, later on, when the extent of the movement became apparent, and as firm after firm of American makers opened depôts here, they had recourse to every attempt in their power to decry the products of their antagonists. Many took advantage of the cycling press to heap vituperation upon the heads of all American makers, and to brand the whole of the cycling exports of the U.S.A. as absolutely unsuited for

English use. But the handsome appearance of the American machines, combined with their light weight—which, taken as an average, was several pounds below that of the best English cycles as supplied to the ordinary public—made them at once favourites, and it is quite possible that in future years the machine made in America will largely share the home market.

If this be the case, the English maker will have no one but himself to thank. The heads of many firms, during the last few years, have, to a great extent, neglected the ordinary run of business, to enter into combinations and speculations connected with company promotion; and latterly it has become common to see in a prospectus that in future the new company will only use the particular goods supplied by a certain firm, which, of course, has paid heavily for the consideration. The voice of the public, who as the buyers of the goods might well have some say in the matter, is entirely neglected. The Americans are entirely unfettered, and can and will supply anything which may be required. As an example of this, I may mention that I failed recently to obtain from a particular firm, from which three machines were ordered, pedals wide enough to take the rider's feet. At the present time it is very difficult to get hold of such pedals; the makers seem to think that when they have supplied those just wide enough to allow the use of a very narrow shoe, they have done all that is required of them. A visit to every known wholesale depôt in London would not produce a pair of pedals over four inches wide. Many makers list them up to four and a half; but to procure them is another matter. As with pedals, so with cranks and other details. One stock size is reckoned enough—either "six," or "six and a half." No matter whether the rider be five feet or six feet in height, the same must be used.

Whether these ridiculous conditions will be rectified next season remains to be seen; but it is an obvious fact that a machine should be built to fit a rider in exactly the same manner as a suit of clothes. A tall rider wants a machine of similar proportions. For instance, he requires long cranks, to enable him to make good use of the longer reach Nature has endowed him with, and to allow him the greatly increased leverage which will permit of a higher gear. The small man, on the contrary, would find advantage in the use of shorter cranks and a smaller gear. If the American invasion only brings the English manufacturers to consider that they exist as such simply because in the past they have kept pace with the times; if it shows them that they must either consider the public and turn from ignoble methods of gaining money by company promoting and Stock Exchange gambling, or expect to find themselves left out in the cold, and their markets gone; it will then have served its purpose, and the public will be the gainers. As originally imported, the American machines lacked several essential points, which are generally considered a *sine qua non* by experienced road riders, such as gear-case clearance, comfortable saddles, and brakes which can be applied without damaging the tyres. However, it was certain that this state of things would not long continue; and when the requirements of the British markets were known, Brother Jonathan was found on the spot, ready to step into the gap.

The best and latest labour-saving machinery used by English cycle-makers is of American design and make; and it seems only logical that the men who can make the necessary building plant should have no difficulty in using it to turn out a faultless machine. One good point in most of the imported machines is, that all the lugs and other vital parts are made from good drop forgings of mild steel. Those in general use on this side are simply cored castings in malleable cast-iron; a material which, although generally reliable, may, owing to hidden blows in running or failure in the after-annealing process, succumb suddenly without warning.

While malleable iron is the staple article in use in England, there are several firms of note who will have none of it, and use steel instead. As the cost of working this metal, which is forged solid, is considerably more than that of the simple treatment required for the hollow castings, it reflects greatly to the credit of the firms in question. Unfortunately, when completed, there is nothing to show the difference between the two. It is only when a lug has come apart, or a crank bracket torn asunder, that the purchaser begins to doubt the quality of the material. Then next time that he is contemplating buying, he is more particular, and the firm with the best record reaps the advantage. Phenomenal performances on the path may for a time keep a firm to the front, but the tourist requires, in addition to speed, a machine absolutely reliable in every detail, so far as human skill and the best material procurable can make it.

The present stage of the wheel may be described as one in which the great bulk of the public are just beginning to realize its possibilities. What the future will be is a matter for conjecture. That the cycle will be pressed into use for a great number of additional purposes, no one can doubt. Business men have already found out what a saving of time and money accrues from its possession. The country doctor who does not keep a machine in his stable ready for use in the case of a sudden call is rarely met with. The tradesman finds it equally useful for soliciting orders, and the sportsman for conveying him to the seat of his operations ; and no matter whether a man's destination be the cover side or the river bank, the cricket field or the tennis ground, the ubiquitous cycle comes in handy all the same. The angler may be met carrying his rod and tackle ; the gunner finds that a shot-gun is no encumbrance; and the stalwart navvy packs up his spade and pick, and on his antediluvian crock rides daily to and from work.

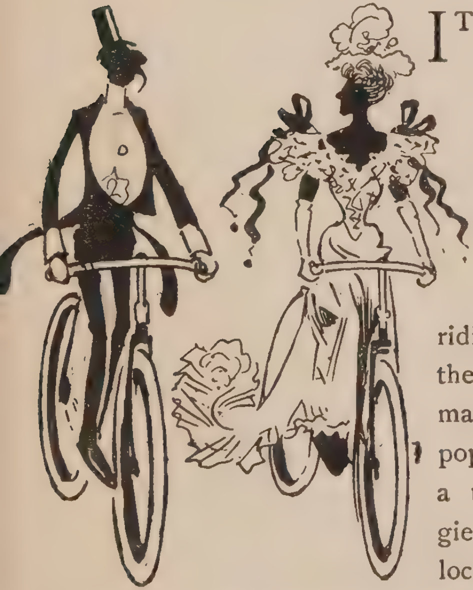
Even the War Office—and it takes a long time for the War Office to find out anything—has discovered the merits of the new invention; and although the cycle has not yet been used in war among any large Powers, it is certain to make its presence felt in the next great European struggle. It has already proved its worth in such out-of-the-way places as the very centre of Africa, where roads, except of the very roughest kind, do not exist; and on the miserable tracks used only by bullock waggons and native carriers, has enabled its riders to outstrip the horse, and convey themselves, and in some cases heavy loads of ammunition, for long distances. One rider, in the late Matabele campaign, successfully transported four hundred rounds of Martini ammunition, weighing, with rifle and accoutrements, over one and a quarter hundred-weight, for a very long distance, and, during part of the journey, maintained a running fight with the natives. What would our London riders think if any one asked them to tackle such a load? Many of them are inclined to grumble at every ounce, and refuse to carry that most useful adjunct, the brake, simply because it weighs, not one and a quarter hundred-weight, but the same in pounds, or just about twenty-one ounces.

Once I thought that I had reached the limits of what a cycle would carry. I was going fishing, and I volunteered to carry the impedimenta of the party by road. As this impedimenta consisted of dinner for four, the same number of waders and brogues in bags, and a four-gallon stone jar—not empty—the weight can be guessed. All went well until descending a sharp decline running down from the Bath road to the river Kennet, when on rounding a corner, with the machine quite out of control, a closed farm gate suddenly came into view. To dismount at the speed at which I was travelling, with the bulk of the weight slung over my shoulders, was impossible; before any attempt could be made to check the pace, the machine was into the obstacle. There was a shock, followed by the sound of breaking timber, and before I quite realized what had occurred, the machine was through the gate, and speeding on its course unharmed. A subsequent investigation proved that the wood was rotten, and the extra weight on the cycle, added to the impetus, had carried all before it. The only damage was a few scratches on my legs and arms, and a very small setting back of the front forks. The stuff in that bicycle was good; had not I, the maker thereof, expended hours—even while the cocks crowed the dawn—laboriously cutting out the lugs from the toughest bars of steel in my possession? Not a brazing was passed that was not clean and perfect. The machine served me well for about twenty thousand miles, and the last I saw of it, in the hands of a working man, proved that hard wear extending over twelve years had not exhausted its vitality. Originally a solid tyre, afterwards converted to a pneumatic, it wore out altogether seven pairs of tyres, and like the celebrated "one-horse shay," may still be doing its owner yeoman service. A really good machine is a treasure, and should not be readily parted with. It does not follow that one a pound or two lighter is an improvement, if the reduction is accompanied by any loss of rigidity. Like a new horse, the peculiarities, and I may almost add temper, of a new machine cannot be discovered in a day.

CHAPTER II.

THE CYCLE IN SOCIETY.

By Mrs. F. Harcourt Williamson.



IT was women who first made bicycling the fashion. At least ten years before there was any idea of women ever riding on wheels, the bicycle had made its way into popular favour as a useful and hygienic means of locomotion; but it might have been always confined to the business of the comparatively few instead of being applied to the pleasure of the many, if by some happy chance it had not been taken up by the right people and straightway become the craze of the season, while it is well known that what once is approved by the classes will in the end be patronized also by the masses.

In the beginning the bicyclist was called—and for a time the title stuck—"A cad on castors:" it was only a few very daring people who braved opprobrium, and made a convenience of the new machine. At a comparatively later date, clerks who lived out of London began to appreciate its uses, and after a time women (also engaged on business) were to be seen winding their way from the suburbs to the City. Then the professional men began to use it a little, but still the exercise was condemned by the majority as vulgar; and—remembering how only a few years ago the appearance of a cyclist was greeted with derisive cheers, and how mischievous urchins took delight in throwing down their caps before a machine in the hopes of an upset; remembering, too, how adventurous women were almost mobbed upon their first appearance riding—it is difficult to realize that now all the

After a Gymkana.

royalties in Europe (except the Emperor of Germany, who is very dogged in his disapproval of the sport as suitable for ladies!) are patronizing the sport; and boys in red uniforms, with the name of "Gavin" on their caps, may be seen waiting on the steps of Mayfair and Belgravia Mansions to clean the aristocracy's machines.

History has not recorded which of the fashionable women was first to discover the delight of whirling all over the country on two wheels; but it was certainly Lady Norreys who first excelled in this direction, and I can well remember seeing quite a little crowd collected at her door in Great Cumberland Place to see her start upon her ride, when, regardless of her admiring audience, she jumped lightly on to her machine, and ringing her bell smartly once or twice as warning, wheeled away, with her dogs frisking and barking behind her. She knows nothing whatever of fear; and with quite unruffled countenance will cross that dangerous wide space between Constitution Hill and Piccadilly, and turn up the hill of Hamilton Place, as unconcerned and cool as though she were on one of those beautiful broad level roads in France, where vehicles are so delightfully few and very far between. She is always very neatly dressed, generally in dark blue, with white revers on her coat, and a natty sailor hat; but I have seen her sometimes very smartly clad with a fluttering silk blouse and flowered hat, if always the same neat and perfectly cut skirt. Another little lady who led the way where this fashion was concerned, was Lady Cairns, who, like Lady Norreys, is very small in stature and slim, while it is well known that very slender figures look their best upon wheels. She is a very plucky rider, too, and one hears of her in the neighbourhood of Windsor flying down-hill with two or three companions as daring as herself, all hand-in-hand, and not one of them even attempting to guide their machines, but trusting entirely to balance. The very good riders all pride themselves upon being able to ride without touching their handles; and Miss Muriel Wilson, who is another smart cyclist, has been seen again and again in Hull, which is the nearest town to Tranby Croft, with one hand thrust into her coat pocket, and the other engaged in holding up her parasol.

I have laid it down, as a rule, that only small women look their best upon wheels, but this, like every other rule, has brilliant exceptions. Few women ride more gracefully than Mrs. W. H. Grenfell. I have seen her dressed all in soft green, a tweed skirt and velvet blouse, with gold belt and velvet Tam-o'-Shanter, looking more distinguished than anybody else as she passed through the throng in Hyde Park. At Battersea, which was always the most fashionable venue, Lady William Nevill and her tall husband were often seen riding together; and Lady William, always neat and well-dressed, looked her very best in navy blue, with a white sailor collar and cloth toque. Lady Minto, who bicycles nearly as well as she skates, and Lady Griffin, who is also a very pretty rider, are both generally seen in navy blue and white, with sailor hats; and Lady Lurgan, one of the very best bicyclists, spent much of her time when she had a house on the river, not on the river itself, but on wheels.

The whole secret of a woman looking well upon her bicycle lies in the cut and the hang of her skirt. There have been numberless inventions, some of them happy enough, but the very best skirt of all, in my opinion, is one made by Busvine, the great habit-maker, and made on the same lines as a habit, fitting the figure perfectly, and cunningly stretched and shrunk (as habit-skirts are) so to do. Once the skirt is successfully negotiated, the rest of the attire is simple. For the summer a fawn-coloured skirt is useful, as it defies the ravages of dust; and a bolero coat with white revers and a white leather belt, and a pink or blue, or any coloured shirt, can complete a neat costume. Then, say, a grey Melton is chosen for the winter, a longer tight-fitting coat might be worn with the revers, say of grey suede, or grey snake-skin, which has in it little flecks of white; and even in the winter a soft white shirt of muslin and lace may be worn with a touch of rose velvet at the throat, as only this velvet will be seen when the coat is buttoned across. But the coat, like the skirt, must be cut by a master hand, and perfectly fitted.

I have seen black look very well on a bicycle. Mrs. Arthur Paget has a wonderful skirt—made in America, I think—which is perfectly shaped like a habit, and makes her look even slimmer than she is; and many women look their best in white—for instance, Lady Warwick, who wears an all-white costume, with white hat and gloves and shoes to match her white machine. Lady Archibald Campbell is generally dressed in drab, and her smart machine is painted to match. After all, however, the skirt is the thing, and once having this perfect, there is no reason why one should not wear an elaborate blouse and really smart hat on a fine day. In the country, especially, it is convenient to be smartly dressed if bound for a musical-ride or a garden-party. Miss Van Wart, who rented Huntercombe Manor last summer, had a band up from London, as well as a very good instructor, and had musical parties every day for a month, with changing house-parties and guests every day from Maidenhead and Windsor.

Lady Archibald Campbell, an authority upon such subjects, has laid it down as a law that no costume can look equally well when walking and when upon wheels; but in speaking of cycling dress it is impossible to ignore the divided skirt. A young lady who took part in many of last season's musical rides looked particularly well, I remember, in one of these, which was made by Viola in grey Melton tweed. On the machine it looked particularly well, as it naturally fell in equal folds on each side of the wheels; and even walking quietly about one did not notice the division, which was only at the back, and hidden among pleated folds. With this skirt was worn a little soft shirt of mauve silk, fastened with two tiny diamond brooches as studs, and a hat trimmed with mauve flowers completed a very taking *toute-ensemble.* The divided skirt is sometimes made divided altogether, but oftenest with a kind of apron front; in any case, it is a compromise between the ordinary skirt and knickerbockers, and some people seem to consider it the happy mean.

The knickerbocker pure and simple is a very unbecoming style, the short full bags which are seen so often in the Bois de Boulogne being quite incompatible with elegance and grace; but I have seen women look charming in these semi-manly garments when properly planned. Lady Eden, for instance, used to wear very long ones like Turkish trousers "soleil" pleated, and wearing them with a little bolero coat and broad belt, she looked as feminine and charming as possible. Lady Augusta Fane, as good a bicyclist as she is a rider, has also worn a most becoming rational costume abroad ; and at Monte Carlo two ladies dressed alike in black satin breeches, silk stockings, and diamond buckle shoes, with a kind of Louis XVI. coat adorned with paste buttons, were very much admired. What can be done with grace abroad is almost impossible in England, and here I have never seen anybody really look well wearing anything but skirts.

Mrs. William James writes an amusing article about bicycling in the "Book of Beauty," and in this she points out very truly how the bicycle has come to be so carefully considered that no menial is entrusted with the task of putting it into the guard's-van when travelling about, and how when at home it finds its home, not in the stables or any outbuildings, but in the hall itself. In the marble hall of Chelsea House, in Londonderry House, in Grosvenor House, and other most palatial mansions, the bicycle-stand is now a matter of course, and many people, including Lady Evelyn Cobbold and Lady Henry FitzGerald, who both bicycle well, are careful not to leave their machines exposed to the damp air and to dust without a cover. It is rather amusing to see a machine being wheeled along a platform snugly encased in its Crom-a-boo cover—a great protection from the scratches which so frequently disfigure a new coat of paint. It is certainly the exception nowadays to see a bicycle with ordinary black or unembellished paint. Most women and many men have their machines painted in their own particular colours. Lady Huntingdon, for instance, has her machine painted green with primrose lines upon it; Miss Cornwallis West's colours are crimson and blue; Princess Henry of Plesse has the prettiest white machine that ever was seen; and no expense was spared in the finishing off of General Stracey's machine, which is done in the well-known red and blue of the Guards.

Once bicycling became the fashion, there was naturally a demand for ladies' clubs, and first of these to spring up was the Trafalgar Club, a charming homelike little residence where tea and scandal were served daily through the season; and where the *élite* came to practise on a covered track, while the neighbouring square was also placed at their service. It was here that the musical ride was first seen and very much admired, when Lady Norreys, Lady Cairns, Mrs. Standford,

A March Past.

and Mrs. Charrington were the four lady riders; and Lord Brackley was quite the best among the four men. So successful was this primary endeavour, that later on an illuminated ride was the excuse for a very cheery evening party, when the lady riders all wore white. It is difficult to think of any suitable costume for a man, as men are adverse to fanciful dress; but the ordinary blue serge suit and straw hat, generally seen upon the river, is suitable for bicycling as well, although when on a tour the dusty roads and possible wind seem to call for a tweed costume with knickerbockers, thick stockings and shoes, and, of course, a close cloth cap. Cycling to Ranelagh was one of the fashions of last season; and on the hottest days smart ladies might be seen riding through the crowded Kensington High Street and Hammersmith Road on their way to lunch or tea at the club, of which Lord Ava is now the managing director, and which is now such a popular resort.

Other lesser clubs sprang up, but fell rather flat; while the sensation of this next season will be the opening of the Cycling Club at Sheen House—a beautiful old mansion which was a royal residence in the sixteenth century, and was more lately occupied by Comte de Paris. Royalty has promised to patronize the club; Sir Lepel Griffin is chairman; and amongst other patrons are Lord and Lady De La Warr, Lord Portarlington (a very keen cyclist who rides a very smart "Nelson"), Mr. Schomberg McDonnell (who made that historic ride from Hatfield to the Foreign Office with despatches), Colonel Carington, and General Stracey. The house itself is very beautiful, with Adam decorations, a large hall suitable for theatricals or dancing, and a charming winter garden; while not only will there be a splendid cycling track, but grounds for lawn tennis and croquet. The convenience of the club will be that people can go to Richmond by carriage or by train, and having their costumes and cycles at the club, can from there start their rides.

Only reckless riders venture to breast the traffic of the London streets, and one of the best ways of getting out of London is by railing to Kingston (unless you care to go by road, when the distance is nearly twelve miles), and from there riding along the river by Portsmouth Road, straight on past the waterworks and Thames Ditton, to Esher (which is fourteen miles from London), or four miles farther on to Cobham by a straight but undulating road. Three more miles, and you reach Ripley by a short steep ascent and steep fall over Pain's Hill and Wisley Common. From there to Guildford is a famous level road, with a beautiful surface and very gentle rise. This, the famous Ripley road, is one of the simplest, best, and most favourite routes out of London; while another *viâ* Kingston is by the Portsmouth Road, turning to the left at the waterworks through Long Ditton by a straight road, but with a general rise, to Leatherhead, and perhaps straight on through Mickleham to Dorking, a distance of twenty-four miles if you go all the way by road. A very favourite route is by the Hounslow road to Staines, and then on through Virginia Water to Ascot: by railing to Hounslow Barracks you miss the London traffic and the tram-lines in Hounslow itself.

Many people prefer bicycling abroad, and certainly the roads in France are wonderfully kept. They are almost invariably smooth, comparatively free from dust, and fairly level, with only pleasant undulations to relieve the monotony of always riding on the flat. The pleasantest time can be spent journeying through Normandy and Brittany, and those who love the sea may care to explore the smaller places on the coast near Boulogne and Dieppe, or in the neighbourhood of Trouville. Although at some of these places there are no hotels, the old-fashioned inns are very comfortable, and interesting too.

At the same time, unknown England is well worthy our attention, and many interesting tours may be had through beautiful country in the spring of the year and cool autumn days. Some very good roads are in London itself, and when the craze for bicycling was at its height, gay parties used to find their way into the City at midnight, when the usually crowded streets were all deserted, and the smooth macadamized surface was quite free from traffic. On summer evenings, too, expeditions were often made to dinner at the Crystal Palace. But danger lay in both these diversions. Several times accidents occurred, on one occasion a young lady finding herself separated from her friends in the City in the small hours of the morning, and on another occasion a bicycle breaking and a lady finding herself many miles from home and dependent entirely on the care of her male escort.

The beginning of cycling was the end of the chaperon in England, and now women, even young girls, ride alone or attended only by some casual man friend for miles together through deserted country roads. The danger of this is apparent; but parents and guardians will probably only become wise after the event. Given a lonely road, and a tramp desperate with hunger or naturally vicious, and it stands to reason that a girl, or indeed any woman, riding alone must be in some considerable peril.

EXPLANATION OF TECHNICAL TERMS,

WITH THICKNESS AND DIAMETER OF TUBES IN THE BEST MODERN MACHINES.

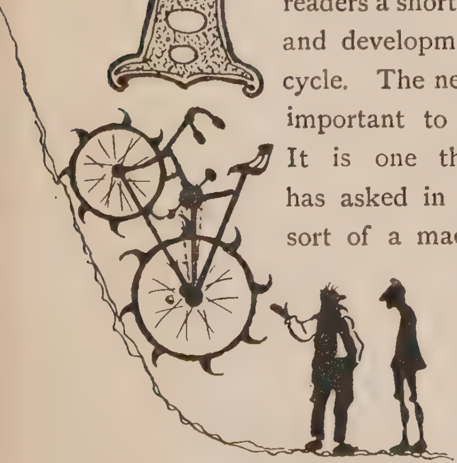
		Inches.		Gauge.
1.	Top tube, average diameter	1	... average thickness	22
2.	Diagonal tube ,,	1⅛	... ,,	22
3.	Bottom tube ,,	1⅛	... ,,	22
4.	Socket tube ,,	1⅛ or 1¼	... ,,	24
5.	Fork crown.			
6.	Fork sides ,,	oval 1¼ × ½	... ,,	20
7.	Handle-bar stalk ,,	⅞ or 1	... ,,	18
8.	Handle-bar ,,	1	... ,,	22
9.	Saddle pillar stalk	1	... ,,	18
9a.	,, L-piece ,,	⅞	... ,,	16
10.	Seat lug.			
11.	Crank bracket.			
12.	Cranks.			
13.	Compression stays ,,	⅞	Often oval or D-shape. 18 gauge on chain-side, 20 gauge on off-side.	
14.	Back stays ,,	¾	... average thickness	22
15.	Spocket wheel.			
16.	Clamping lug for handle-bar.			
17.	Front hub.			
18.	Chain adjuster.			
19.	Hub chain ring.			
20.	Back hub.			
21.	Bridge.			
22.	Chain.			

CHAPTER III.

ON THE CHOICE OF A MACHINE.

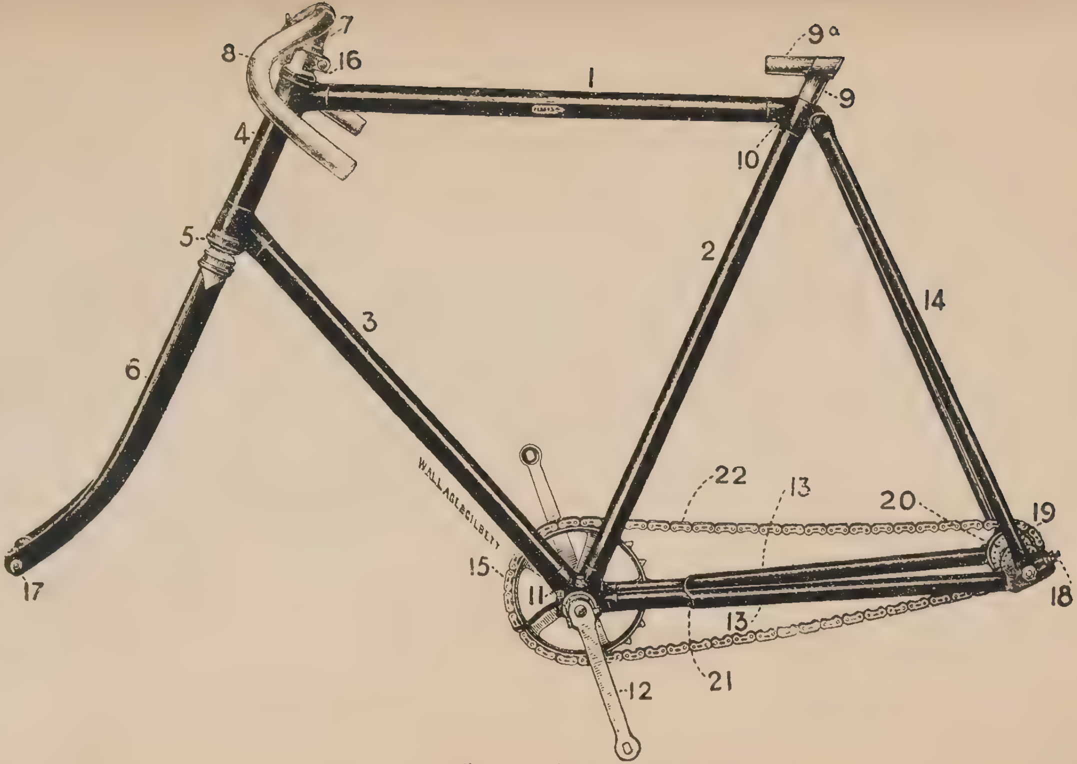
(*Of price, of makers, of the rider's weight and height, of the steering post, fork-crown, and front forks, of the frame, of wheels and their spokes, hubs, rims, and brakes.*)

Of price.



IN the first chapter I gave my readers a short history of the rise and development of the modern cycle. The next question is all-important to a bicycle buyer. It is one that every cyclist has asked in his time—"What sort of a machine ought I to get?" To this it is impossible to give any definite reply; the answer entirely depends upon the requirements of the rider, his weight, and, to a great extent, the depth of pocket. Despite of all advertisements to the contrary, a buyer must recognize the fact that it is simply impossible to get a really well-finished, serviceable machine at a low price. If he does not believe this statement, let him try and see. Experience is an excellent, though severe teacher. When the cost of the tyres has been deducted from the sum given for a low-priced machine, a very considerable amount will be found to have disappeared from the total price paid, leaving the manufacturer not enough to allow of his obtaining the best material and employing the most skilful labour. At present the market for tyres is controlled by the great Dunlop Syndicate; and the price is maintained, by means of the patent rights they hold, at more than double that at which it would stand were such restrictions removed from their manufacture. The only tyres sold at present free from such artificial augmentation of price are those known as non-detachable: their merits and faults will be properly described in a later chapter.

The lowest price at which a really good machine can be bought is about £15. Though there are many in the market to be obtained for


9a
WALLACE & GILBETT

(See page 62.)

£10, or even less, I cannot recommend their use. Some may last fairly well, but to expect to find the best work in their construction would be, on the face of it, absurd. At the same time I do not intend to imply that all cheap machines are shoddy. But a sufficient sum must be expended to allow of a reasonable margin of profit to those engaged in the trade. This alone will ensure the requisite care and the best material. The skill of the polisher and plater, added to a free use of enamel, will make a badly-finished machine appear to the uninitiated quite equal to another for which double the price is asked. It is quite possible that the latter may be too dear; but the buyer will more probably obtain lasting satisfaction from its purchase than if he blindly invests in a machine, the sole recommendation of which is its cheapness.

Of makers.

The largest makers naturally charge more than their lesser brethren. Their establishment expenses have to be added to the cost of the machines they manufacture. Their name is also a guarantee that their work will be found reliable. But this is the same in every trade. At the same time a cyclist who has learnt from experience what constitutes a good machine may possibly be able to find a small maker, who, by buying the best components and fitting them together skilfully, will turn him out a machine at a very much lower cost, fully equal to one of the very best obtainable from the large firms. A skilful mechanic, aided by the ordinary tools to be found in any properly-equiped repairing factory, will be able to build a machine second to none. While such excellent hubs, pedals, and other fittings, are turned out by Eadie, the Birmingham Small Arms Co., and the Cycle Components Co., he starts at no disadvantage with the big firms. In all the large manufacturing towns there exist firms who make a speciality of enamelling, plating, polishing, etc., for the trade. To these people the small maker is able to apply and obtain the necessary finish that his work requires.

In my long experience I have ridden many hundreds of machines, and amongst those of well-known make the difference is really small. Occasionally a cycle of quite exceptional excellence is turned out. Why this should be so I cannot explain; but that such is the case all riders of lengthy experience will admit. Two machines of the same make, and identically the same construction in every detail, will yet differ in pace to the extent of some miles an hour. One such machine may be mentioned, a solid-tyred Raleigh, built about 1887, which won a reputation among my friends as being a wonderfully fast machine. I eventually bought it for more than its original cost after a trial, in which I found that its merits had been by no means exaggerated. It was certainly two or three miles an hour faster than several sister machines purchased at the same time from the same firm. On examination no material difference could be found in its construction. On this machine, after the introduction of the pneumatic, I paced some record-breakers from Speen Moors to Reading well under the hour, being called upon several times to moderate the pace.

Other instances could be recalled of the superiority of individual machines among the old Ordinary bicycles, were such examples required; but all old riders will be able to bear witness to the fact, and doubtless will be able to remember having at some time or other a machine which was above the average for its running power and comfort. These qualities generally go together, for if a machine vibrates and does not run steadily at high speed, no pace can be got out of it. It fatigues and unnerves the rider. Not that mere speed is the sole object to be aimed at. What the average rider wishes to do is to get over the ground with the least amount of fatigue possible. But it is only reasonable to suppose that a machine which will, when forced, allow him to outstrip his companions of equal calibre, will be the one which will cause him least exertion to propel in ordinary use. The aim of all makers who wish to gain a lasting reputation is to build cycles that run lightly and easily, and to attain that end, every ounce is removed from their machines which is consistent with efficiency. It is this saving of weight, when followed by no decrease in the strength of the vital portions of the machine nor loss of rigidity, that has enabled the wonderfully increased speeds of modern times to be accomplished.

A very slight bending of the frame when the power is applied will cause enough friction to neutralize the gain obtained by reducing the weight of a machine by several pounds. The principal part where springing takes place is about the region of the crank bracket. This gives first to one side and then to the other, as the pressure is applied to each pedal alternately. The two wheels upon which the chain runs thus get out of line, and the chain, instead of paying on to them fairly, grates against the sides of the teeth. If much power is being applied, this sets up a binding action, causing the machine to drag, and showing its after-effects by wearing bright places in patches on the edges of the teeth. It is simply on this account that tandems are as a rule bad hill climbers; but the same defect exists in ordinary machines, though to a less extent.

Probably the only point in which practical riders have found any benefit from the much-vaunted Simpson chain has been that it is easier up inclines. Very likely the decreased stress on the chain wheels may have something to do with the matter. That it can gain power in any way from increased leverage is of course a mechanical absurdity. The very small experience I have had of this chain has not been sufficient to enable me to give an opinion of its merits. Certainly I was not conscious of any great increase in power, and riders whose opinions I have asked acknowledge that it has good hill-climbing powers, but complain that it makes a considerable amount of noise and does not run on and off the cogs nicely; the movements being felt by the feet as on a geared Ordinary when the gear is new.

Of a rider's weight and height.

The first point in buying a new mount is carefully to take into consideration the particular purpose for which it is required. Is it merely for occasional recreation, and is the rider already proficient and able to treat a light speedy machine as it should be treated? If so, he can venture on a much lighter bicycle than would serve for one whose machine was wanted for daily use during all weathers, and which must be always ready and seldom at the repairer's shop. A man should be measured for a bicycle as if for a coat. His weight must be taken into account, and his height and build studied before a good fit can be obtained. Nothing looks worse than a tall man on a pigmy machine with a foot of saddle pillar sticking out, and the handles raised to their full extent. In addition to the appearance, this is bad for the machine. The vastly increased leverage tends to spring and warp the frame. If carried to extremes such a misfit becomes positively dangerous, for it is no uncommon thing for machines to be brought into the repairing shop with saddle pillars bent backwards to a point at which they must have soon broken off short, with disastrous consequences to the rider. Fortunately, the makers have now seen the error of their early ways, when all machines were built to one standard height and the requirements of the tall or short rider were met by simply adding to or cutting off a few inches in the handle-bar stem and saddle pillar. Frames are gauged in height by the length of the tube which carries the saddle pillar, and this varies from 18 to 28 inches in length. As the length of leg is the real test of the size of machine to suit the rider, a trial of two or three different mounts will be the most satisfactory method of gauging the size of machine to be chosen. To fit a rider perfectly the machine should only allow of about one inch of saddle pillar out of the socket when it has been adjusted to the most comfortable reach. Of course the make of the saddle should be considered before coming to a final decision. The springless racing saddles, which have been so popular in the past, now appear to have had their day and to be giving way to more rational articles less calculated to communicate every jolt and bump in the road directly to the rider without mitigating or decreasing it in the slightest. As a rough guide, the following table will enable a selection to be easily made :—

Height of Rider.		Diagonal tube.
From 5 feet 0 inches to 5 feet 3 inches	...	18 inches
,, 5 ,, 3 ,, 5 ,, 6 ,,	...	21 ,,
,, 5 ,, 6 ,, 5 ,, 9 ,,	...	23 ,,
,, 5 ,, 9 ,, 6 ,, 0 ,,	...	25 ,,
,, 6 ,, 0 ,, 6 ,, 3 ,,	...	27 ,,

Of course the machine should be built with all its parts in proportion. The handles should be raised and the pedals should be wider in the larger machines. The present wretched practice of sending out a mount for a six-foot rider with skimpy pedals only perhaps 3¾ inches wide is absurd on the face of it. Many big men ride in shoes with soles fully four, or four and a half inches wide, and it is at present almost impossible to obtain any pedals wide enough to fit them comfortably.

Of the steering

Every increase in their length makes the tubes less rigid, in exactly the same manner as the *post, fork crown, and front forks.*

increase in the span of a bridge. Choose, therefore, a strong-framed machine if you are built of too substantial flesh. See that the diameters of the tubes increase with the height of the machine. Look carefully at the steering post, fork crown, and front forks. It is seldom that a frame breaks in any dangerous manner save in these vital points. Should the steering post snap short off—as, alas! too many do—or the fork crown crumple up, there is no telling what the consequences may be. This form of accident generally occurs going down hill when the machine is at its highest speed, and the rider is pitched on his head, and if nothing worse than a few scars and cuts results, he is lucky. C. A. Smith, the well-known Bath road rider, nearly came to an untimely end owing to an accident of this nature.

For riders above ten or eleven stone the tube of the steering post should not be less than one inch in diameter. Fork crowns should be made from steel stampings rather than malleable iron. At the present time fully 50 per cent. of those in use are of the latter material. The forks themselves are very much safer and better when made from weldless tubing, although those made from good sheet steel, brazed up at the edges, answer tolerably well for ordinary requirements. For the absolute neophyte, I may here mention that brazing is a form of hard soldering. Copper kettles are brazed, and every tinker dignifies his office by the title of brazier. To return to my subject, the difference can be told by examining the insides just under the crown, where a small seam may be seen for a quarter of an inch or so showing through the enamel. This is caused by the brass running out when the workman is brazing in the fork sides. The brazing is so well done in those of good makes that it is impossible to detect the seam in any other portion after the enamel is put on. If the forks have a good liner or reinforcement properly brazed in at the crown they do not often go wrong there; a more frequent place being at their lower ends, where the holes for the wheel spindles are drilled. In this region cracks often make their appearance. I cannot recall an accident happening from this, but one might occur if both forks cracked simultaneously; however, many machines become disabled from failures in this portion of their construction, the general effect of which is to allow the front wheel to lean to one side until it rubs against the forks and, acting as a brake, pulls the rider up. Given a properly constructed pair of front forks, with crown and steering post equally sound, the rider should have no occasion to feel nervous when flying any hill at any speed at which he is capable of controlling the machine. Now that the use of the brake is becoming general, it is more important than ever to see that all is sound forward, to enable the machine to stand the strain caused by its application. Having disposed of what in my idea is the most important part to be studied in the whole of a machine, the other details can be now considered.

Of the frame.

The frame itself requires but a small amount of space, as the universal diamond pattern is now adopted by every maker of note. See that the tubes are large, and that sufficient clearance is provided between the tyres and forks to allow of riding the machine in all weathers without the mud fouling and clogging, so as to block the wheels. There should not be less than a quarter of an inch between the sides of the tyre and the frame, and at least half an inch clear over the extreme top of the tyre and under the brake spoon. So many machines have been sent out during last year with insufficient clearance, that this is a most important point. If built too close, it is simply torture to have to propel the machine in heavy weather. All the mud accumulates in lumps under the head; and this means a series of full stops while it is poked out with anything handy, from a pocket-knife to a twig from the nearest hedge. In addition to this a continual shower of grit is flung backwards on the rider's feet and legs, covering him, the pedals, and lower portions of the frame, until the machine and rider look as if they had been rolled in a heap of road scrapings. The benefit of clearance is most noticeable when riding after the break-up of a frost, for then the roads become extremely rotten, the mud tenacious, and the going heavy.

Of the wheels.

The wheels of a machine are now generally made of equal size, and although for preference I should choose a slightly increased size for the steering wheel, twenty-eight inches in height is now the standard. Many makers fit a reduced size of tyre on the leading wheel, but I think it advisable to have both fitted with the same size of tyre, so that they can be interchanged.

The steering-wheel has a very much less amount of wear than the driving-wheel; by sitting back it is possible to ride long distances with almost no air in the front tyre, so that in event of an accident happening to the driving-wheel tyre, and only a poor repair being possible, the rider can, by changing the tyres, reach his destination. To ride a tyre deflated with any weight on it is to court its destruction.

Of spokes.

The gauge of the wheel spokes is more a matter that concerns the makers. There is no object in having them too thick; sixteen gauge will prove sufficient for the front wheel, and one size larger for the driving-wheel when a rider is under twelve stone. Above that weight a size larger should be employed. There is considerable difference in the quality of spoke-wire, the best being known as "high tension," and costs about double the price of ordinary. Bad wire may creep into any machine from no fault of the manufacturers, and its presence only becomes known by the spokes continually breaking, until, if not checked by rebuilding, the whole wheel will go to pieces. Spokes known as double-butted are the best, and will eventually come into general use when they can be procured more readily than is now the case. They are made with the extreme ends a couple of gauges thicker than the middle. As it is always at the ends that the spokes break, these butts enable strength to be distributed at the right place to withstand the strain. The following are the weights of a set of spokes, forty in number, for a back wheel:—14 gauge, 11 oz.; 15 gauge, 9 oz.; 16 gauge, 7½ oz.; double-butted, 14 gauge to 16 gauge, 8 oz.

The usual number of spokes employed by the majority of makers is forty for the driving-wheel, and thirty-two for the front wheel. Although this number makes a very strong wheel, it could be reduced with advantage to about four-fifths of the total in cases where good hollow or wood rims are used. This will prove quite sufficient, and save a good deal of windage. All the foregoing remarks refer to tangent spokes, which have now become quite general in use, the obsolete direct variety being only found on very inferior machines, in what is impolitely known as the "pitch and gas-pipe" class.

Of hubs. No particular mention need be made of hubs. It takes an expert to discover their qualities from an outside glance. The latest developments tend more to the barrel form, which are supposed to be oil-retaining, and to save trouble on that account. However, the advantage is more in theory than anything else, and a good hub made on the old plan answers very well, and is, to say the least of it, free from the complications of some of the later patterns. There is nothing new in these barrel hubs. I remember using, fully fifteen years ago, a pair made almost exactly on the same plan as some now advertised as "patent." The only thing with which the buyer should satisfy himself is, that there is enough clearance between the spokes and the chain-wheel attached to the hub to allow of a gear-case being fitted if at any time he should require it. If the machine is of the semi-racing class, and intended, more or less, as a toy, this can be ignored. The makers will be found to have left no room for it on their lightest patterns.

Of rims.

Rims, the portion of the wheel which carries the tyres, are perhaps one of the most important points to examine in selecting a machine. It is absolutely essential that they should be of better quality than many of those known as "solid," which, in the author's estimation, are only fit for the scrap heap. They buckle on the slightest provocation, the sharp edges cut the tyres, and also will take chunks out of the rider's flesh should his fingers get caught between them when detaching a cover. An examination of the rims will give a fair estimation of the quality of the material to be found in the rest of a machine. If fitted with either good wood or hollow steel rims, the purchaser may rest assured that the manufacturer was not actuated by motives of excessive economy in its construction. The price of the best hollow rims are about three times that of solid. The most popular steel rim is the "Westwood," and this is now adopted by the Dunlop company as their standard rim. It is undoubtedly the most durable and best steel rim ever devised for pneumatic wired-on tyres ; it gives equal satisfaction, both to the person who rides the machine and the man who builds it. Its rounded edges do not damage the tyre, and when properly enamelled the cover comes off readily, and is just as easy to replace. The spokes do not pull through it, and as no soft solder is used in its construction, it can be subjected to a high temperature, thus enabling it to be enamelled with that marble-like finish so desirable in a machine.

The next most popular hollow rim is the "Jointless." This is a most ingenious piece of work made from sheet-steel, which is stamped into large circles, and then by the aid of most powerful presses, followed up by automatic spinning-machines, gradually transformed into the requisite shape, thus enabling the two sections comprising the inner and outer shell to be fashioned into the finished article. This rim has been adapted as the standard for the Palmer and the Clincher tyre. It possesses, however, several disadvantages. Owing to soft solder being used to join the inner and outer section, it cannot be enamelled at a very high temperature, consequently the finish is somewhat lacking. Secondly, owing to the steel from which it is made being very thin, there is a prospect of the spokes pulling through if heavier wire than 15 gauge is used, and much tension employed. Further, the thin edges are liable to be cut by stones, and otherwise damaged, when wired tyres such as Dunlops, or others employing the same principle, are used. One very good point, however, in this rim is that it is "dead" true when sent out, and, if carefully built, takes even less trueing than a good wood rim. Neither has it soft places in it caused by the fire in brazing, as is the case with all other metal rims.

Wood rims are, in my estimation, far and away the best which can be possibly employed in a cycle. The disadvantage in their use so far has been that the wired-on covers have in some cases burst them from air pressure alone. This defect has been obviated by covering the rim with canvas, and, when it is of laminated section, making the outer section sufficiently large to enable the proper grooving for the tyre to be cut without penetrating through the outer layer of wood. Wood rims owe their origin to the ingenuity of our American cousins, and their use is universal over there. That they will stand our English climate I have proved for myself; in fact, on machines for my own use I never employ any other. The most suitable rim for any kind of wired-on tyre is the "Fairbanks." The "Plymouth" and the "Boston" are both excellent when single tube, or Morgan and Wright tyres are used. If anything, the preference should be given to the latter, which is the more expensive, but, in my estimation, the finer finished article. However, there is little to choose between them. I was the first manufacturer of wood rims in this country, and naturally have had many facilities for discovering their failings and good points. Although I now have no further interest in them, I am so convinced of their superiority over metal, that I should never dream of going back to steel for the rims of my machines.

The objections to the use of wood are principally urged by interested people who are wont to talk knowingly about the difference between England and America in the matter of climate. Further, they argue that wood will warp and get out of shape, forgetting that the steaming process entirely removes this tendency, and that so long as the spokes do their duty, the rim has no chance of suffering such disaster. To one accustomed to trying different machines, the amount of "life" in wood rims is so marked that it can be at once detected even when riding in the dark. For the racing path, however, where the surface is perfectly smooth, it is doubtful if there is much to choose between the best hollow steel and timber, so long as they are both equally rigid and light.

The best wood for rims is probably American maple; but some varieties of English oak are almost as good, trees grown in the north-west of Middlesex being especially suited for the purpose. Young trees should be selected of about 18 inches in diameter, perfectly free from knots or other blemishes for at least eight feet from the ground. The rough blanks should be rent, not sawn from the trunk—a tedious process, entailing a large amount of skill on the part of the workman, but resulting in rims free from any possibility of breaking, owing to the grain running out in any place. Rims constructed in this manner are almost unbreakable, and instances are known where they have been run over by heavy carts without any damage save to the spokes. When ordering a machine built with wood rims, it is wise to previously discover if the manufacturer is accustomed to properly building them. Extra long nipples are necessary, so that the rim has only to be countersunk just deep enough to allow the washer, as the flat disk of metal is called, to be properly bedded. All that portion of the nipple in the wood should be cylindrical, so as to leave no room for wet to enter, as it certainly will do if nipples are used with the flats extending too deep. A little boiled oil applied to each spoke-hole before the nipples are inserted will make the wood quite waterproof. The spokes in wooden rims require to be at a greater tension than is necessary in steel ones. They can be pulled up tight enough to break the wire without damage to the rim, and a second trueing at the end of a week will take up any slack in them, and result in a wheel which will remain permanently true.

Of brakes.

The brake is the next point which requires to be carefully considered. Many of those in use could not be better designed if their sole object was to destroy the tyre rather than preserve it against the destructive action of friction in checking the machine. Nearly all makers are beginning to see the importance of fitting brakes to their machines. The powers that be, in the shape of various Benches of magistrates, have come down so heavily upon brakeless riders when they have, by accident or reckless riding, come into the clutches of the law, that this season the majority of cyclists will find it to their advantage to carry them. It is a difficult matter to discover why the brake—in my estimation a most necessary adjunct to a machine—has been somewhat out of fashion in the past. It may be owing to the fact that racing men have ignored it on account of the slight extra weight, and others have followed their example. The majority of riders will find a good trustworthy brake a positive gain in speed. It allows a pace to be attained downhill that would be most dangerous without it. The rider, assured that he has a reliable check upon his momentum if required, is enabled to "coast" unknown hills with confidence at a most exhilarating pace. If the brake is good, many an accident can be avoided; for children seem to take a distinct pleasure in running out unexpectedly into the roads, while carts suddenly deviate from their course, to the danger of the brakeless rider. The increase in the height of the gearing on modern machines has added to the difficulty of back-pedalling, and, with a big gear, the rider may actually stand on the pedals without stopping the machine. Some riders, when in difficulties, form an extemporary brake by inserting their toe between the forks of the front wheel, and pressing down the foot on the tyre. This is a very certain and powerful method of pulling up a machine on a decline where it appears to be getting the best of its rider, and one which should be remembered should a brake give way. At the same time it cannot be recommended as a substitute for a brake, as it causes much wear to the shoe soles, while the heat generated by friction will prove most unpleasant on a long descent.

The best form of brake is that now generally used in the form of a lever hinged to a fulcrum in the middle of the handle-bar. The lever acts upon a rod, to the end of which a spoon is attached, which is pressed down upon the upper surface of the tyre. Nothing need be said about the lever itself, as all that is required of it is to work nicely without rattle, and the maker of the machine will take care of this. The rod can be also dismissed with very few words. It should be sufficiently strong to withstand the utmost strain the rider can put upon it without buckling. Many, unfortunately, have been made too weak, and have failed when called upon. The rider can test the strength for himself by watching the rod when he gives the brake lever a good squeeze. If it springs out of the straight to any extent it is not stiff enough. The fault is more particularly noticeable on big machines with long heads; for the makers persist in using exactly the same fittings as for smaller machines. The guide through which the rod passes at its end adjoining the fork crown is often too flimsy. In that case the pull of the brake spoon bends it beyond its limit of elasticity, so that it becomes permanently set, and prevents the free action of the rod, which may stick and refuse either to come down or go up. For this reason the preference should be given to a link motion to carry the rod. This works under strain with less friction, and certainly prevents damage to tyres, by allowing the brake spoon to rise and fall, and thus to accommodate itself to the untrue places in the cover, which exist in nearly all pneumatic tyres. Private experiments made by the author prove that neglect of this small fact is the cause of much of the evil of tyre destruction by brakes.

The brake spoon itself is a matter over which much time and thought have been expended. Probably the first step in the right direction was made about 1878 by Mr. McCullum Hill, of the London Bicycle Club, at that time a well-known rider. Finding the ordinary iron spoons sent out by the makers inefficient in wet weather, he affixed various substances under them—leather and oak blocks being in his opinion the best—and the result justified his expectations. For some unknown reason, these never became popular, unless it were that he generously gave the idea to the public, and it became no one's interest to push it. It was not until the pneumatic tyre became part and parcel of the modern machine that the public, finding the ordinary iron shoe an expensive luxury, began to ask for something better. Many makers reverted to the old plan, and affixed pads of rubber to the lower portion of their spoons. These pads, however, were often fastened on by a couple of rivets, which, when the rubber became worn in any way, stuck out and proved more injurious to the tyre than a plain spoon would have been. Then a clever mechanic, Mr. R. F. Hall, invented the double rubber block brake, with four wearing surfaces on each block, which at once was found to be the missing link ; namely, a brake which was so powerful that one finger would easily hold the machine on steep declines, and which at the same time would not damage the tyre.

Many hundreds of thousands of these brakes have been sold, and at the present time they cannot be beaten, although some most ingenious ideas are afloat. Amongst these are brush brakes, constructed with either bristles or rubber, made on a similar principle to the well-known coin mat used by tradesmen on their counters; and rim-brakes, such as that invented by Mr. Linely, an improvement of an old idea used on the "Chester" machines of Messrs. Hydes & Wigfull about 1880. This latter does not, of course, damage the tyre at all, but acts on the under side of the rim, which must be a steel one, and very true, otherwise the brake will only bite in places. It is well spoken of by those who use it, and should have a future before it. Many riders will, however, doubtless object to it on account of the damage to the enamel on the rim, which soon gets worn off on either side where the brake rubs. But if a portion of the rim be polished, say, just a line of about a quarter of an inch wide on either side, this action of the brake will keep it bright and in good condition.

In addition to lever brakes many other varieties have been used, such as the band brake, and, latterly, the pneumatic and hydraulic brake. The band brake has been often tried, both on bicycles and tricycles, and found wanting on account of the difficulty of regulating the friction; sometimes it acts in so powerful a manner as to throw the rider out of his saddle; at other times it fails almost altogether. The pneumatic brake, as its name implies, depends upon the force of compressed air for its application. It consists of a rubber pad fixed in a metal shield on the framework of the machine in close proximity to the back wheel tyre. This pad is capable of being distended when inflated, so that it comes into contact with the tyre, the amount of friction depending upon the air pressure, which is generated by a small rubber bulb on the handle-bar. This is connected with the brake pad by a rubber tube. The rider grasps the bulb, compresses the air, and forces a charge into the pad, the action being repeated until enough power is applied to stop the machine. The principle is correct, but in practice it is found that so much time is taken up by this method of applying the brake, that it becomes almost useless in cases where a sudden stop is a necessity. There is none of that instantaneous action about it that makes the ordinary brake so serviceable. It takes at least three or four puffs to get it on fully, during which time the rider may have traversed some thirty or forty yards. Its automatic pressure when once applied is its great advantage; but, from practical experience, I do not care to recommend its use. It can fail without warning from many causes. The valve may give out, the rubber tubing get kinked, or the bulb come off the handle-bar and remain dangling out of reach. Lastly, the rubber shoe wears out and punctures without warning. All these accidents have occurred to me, and, after a trial of some months, I gave up its use in disgust, after its failure had nearly given me a bad accident.

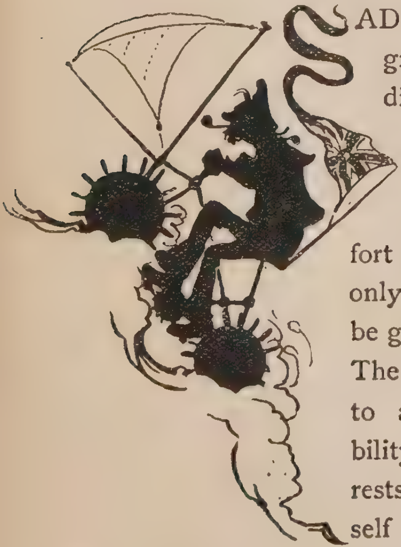
I was returning from a long ride, to Coventry and back, and when nearly home had a very short but steep hill to descend. It was about midnight, and the ground mists caused a heavy fog to hang over the hollows. Arriving at the top of the declivity, I put up my feet, gave a good squeeze or two of the bulb that inflated the brake, and commenced the descent. When only a few yards had been traversed, and the hill was at its steepest, the hissing noise of the brake suddenly ceased, and the machine shot forward with a lightning-like rapidity. Before I could do much more than give a few frantic puffs at the bulb, it was running at a pace which, as far as I could judge, must have approached forty miles an hour. Had the course been clear it would not have mattered in the slightest ; but at the bottom of this particular hill the road takes a curve, and a narrow bridge has to be traversed, with low stone walls on each side. Moreover, I remembered with horror that one side of the decline was guarded by spiked iron railings ready to impale any unfortunate rider who might be thrown upon their tender mercies. To avoid these dangers and shoot the passage was my only chance. The mist was so thick that only a few feet ahead could be seen ; but trusting to luck and a good knowledge of the road, I successfully ran the gauntlet. I remember nothing but a wild rush through the air, one or two confused swerves when I fancied I was against the walls of the bridge, and then at last slowly pulling up the machine some quarter of a mile or so beyond. After this experience that pneumatic brake has reposed peacefully upon a shelf. The tricks of this form of brake were fully exposed by Mr. Bidlake in the *Bicycling News* of September 2, 1896.

As this chapter has already run to some length, I will continue my remarks on the further points to be studied in buying a bicycle in the next chapter.

CHAPTER IV.

ON THE CHOICE OF A MACHINE (*continued*).

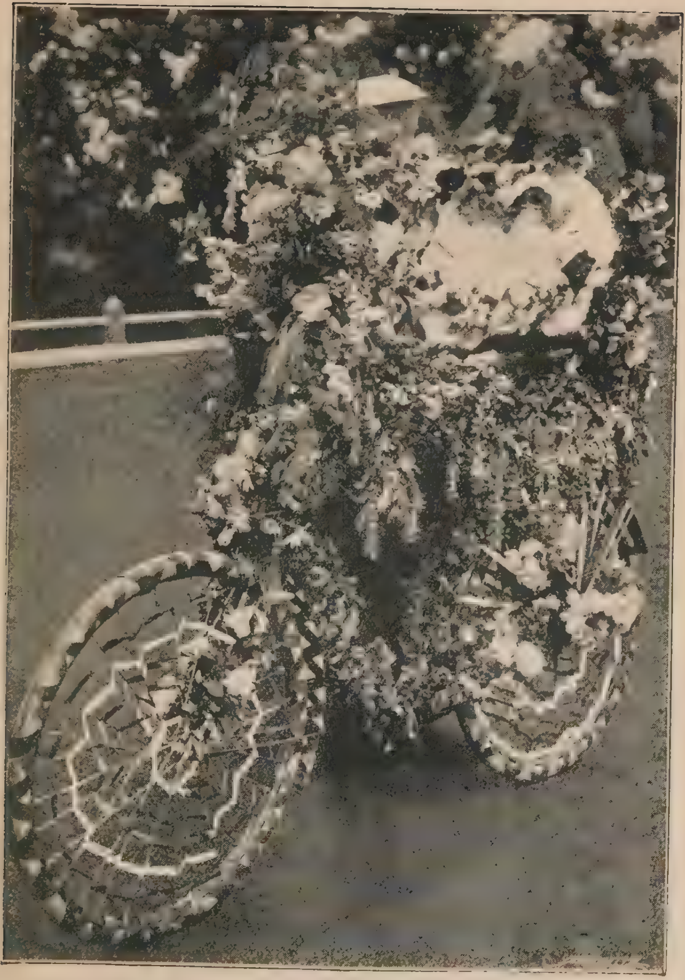
(*Of saddle and saddle-pins ; of handle-bars and handles ; of foot-rests, pedals, and cranks ; of gears, chains, gear-cases, mud-guards, etc. ; of ladies' machines ; of second-hand machines.*)



Of saddles.

SADDLES, although of great importance, are difficult to discuss, as the physical anatomy of riders varies so much. Besides, ideas of comfort differ greatly, and thus only general advice can be given on their selection. The cycle makers decline to accept any responsibility with them, and it rests with the rider himself to see that he obtains one calculated to carry him without that unpleasant feeling, so commonly experienced, of being "ridden on a rail." Many saddles latterly in use have been of the kind known as racing or semi-racing saddles. These are simply a leather covering tightly stretched between two plates on a stiff wire framing entirely devoid of any spring whatever. Although they may be comfortable to those who have become, so to speak, seasoned, they are excessively hard and unpleasant to the ordinary run of riders, more especially to those whose experience does not carry them back to the solid tyre days.

A good saddle should have some spring in it—not too much, or it will give rise to a see-saw motion, causing a loss of power and throwing the rider out of his stride when driving the machine at top speed. The leather top should be made from good substantial hide, and properly blocked to shape. If thin and poor, it will soon settle down and become very hot and uncomfortable by clinging to the rider and preventing a free circulation of air under the seat. If found to press too hard upon the bones, a small cut in the exact place where the pressure exists, easily found by examining the saddle carefully, will soon put matters



A DECORATED CYCLE.

(From Photograph by W. & A. H. Fry, Brighton.)

right. A really good saddle, on which the rider can remain for sixteen hours or so without any experience of discomfort, is a treasure, and should not be readily parted with. It should be kept and changed from one machine to another until fairly worn out. In addition to the ordinary forms of saddles, there are now in the market many of wonderful and peculiar design—some with elongated peaks, others without any peaks at all, similar in shape and almost as large as a good-sized frying-pan.

Each maker now has his speciality, and some, as Messrs. Brooks, of Birmingham, go in for varieties galore. One rider will be ready to swear by a saddle as the very best and finest on earth, which, again, if tried by another will prove to be the very acme of discomfort. I remember that in my early days I used to buy the celebrated "Suspension" saddles of Messrs. Lamplough, soak them in hot water for an hour, ride for a few hundred yards until the soft leather got moulded to my anatomy, then dry in an oven, and give several coats of hard varnish, making the whole saddle as hard as a board and quite waterproof. This method suited me at the time, but now I should regard such a saddle with considerable suspicion. Air saddles have been latterly somewhat popular. The idea is old, and was in use early in the seventies; but of course the modern ones are a great improvement, and are much liked by some ladies. Men do not patronize them much. The old objection used to be want of ventilation and consequent heat of the seat. Moreover, there was an amount of rolling action which was unpleasant. I have had no experience of the best modern kinds.

It is difficult to decide on the best saddle for ladies. Many prefer the ordinary ones as supplied for men's use, which is not surprising considering that many supposed to be particularly suited for ladies are of such construction that it is almost impossible to sit upon them at all. The old "Otto Pan Seat" is again to the fore, only under different names. It was tried and found a failure about the time that Mr. Otto's ingenious bicycle was put upon the market. Alas, that so clever a machine should have come to so untimely an end! The last I ever saw of it was a solitary specimen hung up a tree at the Anchor at Ripley! The amount of thought and skill employed in designing it would in many cases have led on to fortune; but its clever inventor appears to have dropped out of cycling circles altogether, and to have failed to partake in the golden harvest reaped by many more undeserving men during the past year or two of the great cycle boom.

Of saddle-pins.

The saddle-pin carries the saddle, and allows it to be adjusted. It should be strong enough to carry the rider without bending, and should allow of lateral adjustment in either direction. This is only to be attained by the use of a T pin, and such a one should be sent out with every machine. It is an easy task for the rider to cut off that portion which he does not require, when he has found by experience the position which suits him best. Last year brought forth a contrivance called the vertical pin, which on account of its cheapness was fitted on many machines, until the riders would have no more of it. As many are now doubtless in stock in makers' stores, riders should resist any attempt to foist it upon them. The ordinary ┐ pin is a better affair, but as lateral adjustment is only possible in one direction, it often prevents the most suitable position being attained. The standard size for the barrel portion of the saddle pillar is seven-eighths of an inch, and as most saddles on English machines are now made with clips to take this size, it would be an advantage to the rider if all makers conformed to it.

Of handle-bars.

Handle-bars and handles go far to make up the comfort of the rider. If the bars are so bent that it is impossible to reach them without stooping, the rider will find that, although the position seems comfortable for a short distance, it will become excessively painful and induce severe pain between the shoulders when persisted in for any length of time. The use of the fully-dropped bar known as the "Ram's Horn" had its origin in the attempts of the "scorcher" to imitate the racing man; and makers, pandering to his depraved tastes, fitted all and every rider with the same wretched contrivance. Now, however, the Ram's Horn has had its day, and in every list issued by respectable firms handle-bars are to be found of every shape. The most popular patterns may be described as "half drop," "flat," and "reversed bars;" the latter are often to be seen on ladies' machines. Some firms build machines with adjustable handle-bars, and the rider can thus suit himself as regards their shape. This idea originally came from America, and is to be found on many Yankee machines. The best English patent is the one invented by Mr. Mushing, of the Centaur Co., which allows a change from a ram's horn bar as the utmost drop to a reversed bar at the other extreme. The disadvantage of all adjustable handle-bars lies in the fact that in some positions the angle at which the handles are presented is not that which would be most suitable if the bar were bent specially to the shape and height of the rider. The best solution of the difficulty for the makers would be found in fitting a bar with a moderately flat bend, and allowing plenty of stalk in the steering post for adjustment. Some makers during the past season have, either from motives of economy or on account of a saving of weight, reduced the handle-bar stalk to some five inches in length, thus allowing only three inches of possible adjustment. A more silly arrangement cannot be imagined. It entirely neutralizes the advantage of the amount of adjustment to be found in the saddle pillar. It is palpably absurd to make the latter nine inches long, when the rider is only allowed to raise its equivalent, the handle-bar, some three inches.

UNIVERSITY
COLLEGE
LIBRARY
NOTTINGHAM

Of handles.

The material from which the handles themselves are made is to some extent a matter of taste. Cork is good to the touch, and when well fitted and set off with handsome ferrules of either vulcanite or celluloid looks very well. Unfortunately, however, it is not very durable, and but slight rough treatment destroys it. The very best cork handles are those sold by Henry Waterson, of Birmingham; but as they are double the price of others, scarcely differing in appearance, they are not much used now. Cork handles with black ferrules should be avoided; the vulcanite of which the ferrules are composed is brittle and chips easily. Other substances are used in addition to cork—as celluloid, horn, and wood. Probably the best all-round handle is one of felt with metal tips. It is the most durable, looks very well, and when dirty can be easily cleaned with soap and water. Felt is the only substance which will stand rough treatment, and allow a rider to lean his machine against a wall without damaging the efficiency or appearance of the handles.

Of foot-rests.

Foot-rests in some form are a *sine qua non* for all who wish to tour with the maximum of ease. Many different patterns are to be obtained.

In choosing them the buyer should see that they are substantial and not calculated to damage the enamel of the forks. Many riders dispense with their use altogether and make shift with the top of the fork crown, which as a matter of fact is a very good substitute, and to be preferred when the crown is as broad and flat as it is in most modern machines. If the top plate was lengthened and turned up with a few serrations at the edges it would become a perfect rest and do away with the weight and unsightliness of the ordinary pattern, which, like the step, is often calculated to catch and tear the garments of the luckless rider.

Of pedals.

Pedals are roughly of two varieties—Rubber and what are known as "Rat-trap." The former, which, as their name implies, have rubber blocks for the feet to rest on, are more suitable for ladies' use, as they neither dig holes in thin shoes nor catch in a skirt. The weight is, however, about 50 per cent. more than the latter, which take their title from the serrated steel plates on which the feet rest, these having originally been shaped like the steel jaws of a rat-gin. A light pair of good rat-trap pedals weigh just under the pound, and an average rubber pair some half to three-quarters of a pound more. The maker is certain to put a good pair on a valuable machine, and a glance at the pedals often helps an expert to obtain a hint as to the general make of the cycle. Common pedals are sold at a few shillings a pair, and largely bought by vendors of inferior machines. They are as soft as lead, with no wearing qualities; the pins bend on the slightest provocation, and are always getting loose in the cranks owing to the threads being badly cut. They often have brass centres, which are easier to work up than steel. They owe their origin either to the Birmingham garret shops or to some foreign firm — "manufactured in Germany" perhaps, as many of the poorer quality of cycle fittings now are.

Pedals will generally be found wide enough for ladies' use and for those men who are not blessed with feet of more than ordinary width. If, however, they are not sufficiently wide, constant inconvenience will follow. The rider should measure his shoes, and insist upon the manufacturer supplying him with pedals of the required width. The standard widths which are sent out with machines, when no such specification is made, are $3\frac{1}{2}$ inches for ladies', and a quarter of an inch more for men's machines. The form of attachment to the crank of the bicycle is one for which many different plans have been tried. The old method of a simple screw and nut on the end of the pedal-pin cannot be beaten for simplicity and strength, but owing to the universal desire for a narrow tread it has had to be modified, and in some cases altered entirely. When it is now used it is generally in the form of a coned nut deeply recessed into the crank, which has a round instead of a square hole, in which the pedal-pin is prevented from revolving by a small peg. If nicely made this plan is excellent; but unless the work is of the best it gives out very soon, and the pedals are always coming loose. Even the small peg falls out, and the rider has no alternative but to seek the aid of the repairing shop. The best principle is probably to have the pedal cottered in, in exactly the same manner as the cranks are fitted on the axle. This method has been tried for some years on the "Mohawk" machines made by Messrs. Thompson and James, of Chalk Farm, London, and to my knowledge is a very satisfactory plan of overcoming the difficulties of pedal-fixing, without increasing the space necessary to enable the modern narrow tread to be attained.

Probably the next most satisfactory method is to screw the pedals into the crank, either with or without a locking bolt. The locking bolt is not altogether an advantage, as it has to be small, and the necessary pressure which has to be applied frequently twists off the head and leaves the rider with the remains firmly fixed in the crank. To extract it will give full scope to his or his repairer's ingenuity. A good tightly-fitting plain screw is, in my estimation, the best method. Should it at any time develop a tendency to loosen in use, any amateur who understands soldering—or, for a matter of that, the first gasfitter or tinman to be found—will be easily able to sweat it in and prevent any recurrence of the evil. Loose pedals are far too common, and in some cases require more skill in mending than is possessed by many local repairers. To make a coned nut with a "bastard" thread entails the use of a good lathe and the requisite skill to work it—an unknown quantity in many shops where cycles are supposed to be "repaired."

Of cranks. Cranks are now practically made in only two lengths—6½ inches for men's use, and 6 inches for ladies. This may much facilitate matters at the factory; but it is hardly the best thing for the rider. It would be certainly advisable to make longer ones for the use of tall men, and *vice versâ.* However, the rider has no choice in this matter, for he has to take what he can get, whether he be five or six feet in height. As they are made from steel drop forgings, entailing the use of expensive dies to produce, it is not likely that the makers will get out a special pair for a single order. Some firms have already recognized this shortcoming and made arrangements to combat it. Eventually a more reasonable state of affairs will no doubt prevail.

Of gears.

The gear of a machine should be carefully selected, though as a matter of fact it can be altered at any time if found unsuitable. By the gearing is meant the relative proportion of revolutions made by the driving wheel for every turn of the pedals. For instance, supposing that the twenty-eight-inch back wheel revolves twice for each stroke of the crank axle, the machine would be said to be geared to fifty-six; or, in other words, it would be equivalent to driving a machine with a wheel of fifty-six inches. Modern tendencies are towards high gears, and now sixty-eight is a common one for ordinary road riding. Sixty-three is about the right size for those who are not athletically inclined, and prefer ease to speed. The young man about to engage in great feats will not be satisfied with less than seventy, and the regular racing man will often run to something above the century.

Ladies are best suited with about fifty-six, or, when exceptionally strong, perhaps sixty. It must be remembered that they use shorter cranks than gentlemen, and consequently have less leverage, which means more pressure on the pedals. Their machines also are heavier in proportion, and the windage of a skirt is more than would be believed by any one who has not tried the experiment of riding in one. The method of calculating the gear is to count the cogs on each wheel, multiply the height of the driving wheel by the number of teeth on the front chain wheel, and then divide the result by the number of teeth on the back chain wheel; the quotient is the gear. If the machine has a gear-case, and it is not desired to remove it—which, by the way, should never be attempted if all is going well—carefully place one pedal at its highest or lowest point; then place a chalk mark on the floor at the point of contact of the rear-wheel tyre with the ground, and move the machine along until the pedal has made one complete revolution, and is exactly in the same position as it was at starting. Then make another mark there, and after measuring the distance, divide the result by 3·141 or $3\frac{1}{7}$, which will be near enough for a rough estimate. The result will be the gear.

The only way for a rider to discover which gear suits him best is by actual trial; even then it will be found to vary with each machine used, as some, on account of extra rigidity and lightness, allow of higher gears than others. A big gear is perfect when a little wind is behind the rider and the roads are good; but when head winds and heavy roads have to be negotiated, it appears to grow higher and higher every mile, until at last the wretched rider is literally run to a standstill, and the slightest suggestion of a hill results in a dismount. All old riders have, doubtless, at some time or the other experienced this feeling, and I can plead guilty to finding myself in the same plight on many occasions. The best thing to do is to seek the shelter of the nearest railway station. If, however, no such welcome aid be possible, then the only plan is to walk every incline, and take advantage of each sheltered place or declivity for a short ride. By doing this the change of exercise will allow the tired muscles to recuperate themselves, and often a complete recovery will follow, enabling the rider to pick up and make good the pace for the remainder of his journey. Alcoholic aids should only be indulged in when a very short distance remains. The stimulant soons wears off, only to leave the rider in a worse state than before.

This season has seen the revival of several more or less old methods of power transmission, which, in the opinion of the promoters of the companies formed for their manufacture, are destined to improve the chain out of existence. With these views I can by no means agree. The chief of these is a bevil-geared machine, called the "Acetene Chainless Safety," which was perfected in France, and pushed there last season in the usual manner by a phenomenal record performance. Unfortunately, the hero of it has latterly reverted to the ordinary chain-driven machine. There appears to be no novelty in the actual gear itself, which is simply a pair of bevil pinions on a shaft, running over the compression stay on the chain side of the machine, and engaging in two bevil wheels, one on the crank axle, and the other on the driving wheel hub. The patent consists merely in the method of mounting the pinion shaft, which to me appears quite a minor detail, and I fail to see why, if all experiments with this form of gear in the early days failed to disclose any advantage, the mere fact of a trivial detail in construction can suddenly transform it into a superior article to the well-tried chain. My experience with toothed gears applied to cycle driving has proved to me that they waste more power than a chain, are prone to develop a nasty vibration for the feet, and certainly are at a disadvantage in every respect when compared with a good chain.

None of the improvements in the "Acetene" machine are, to my mind, calculated to remove these disadvantages. As a practical engineer, I know only too well the difficulties of cutting bevil gears, which can only be made approximately true by running a cutter through the wheel twice, and so averaging the curves. They run very easily when lightly loaded and exhibited on a stand in a shop window; but when hard pressed the difference in working is very marked, and friction increases in a greater ratio than the increase of load. As now made, the lady's safety of this pattern has no protection for the revolving shaft, and the consequences of a skirt getting caught and wound round this would be most unpleasant, if not actually dangerous. I have seen a three-inch shaft take hold of a handkerchief tied round a cut on a workman's hand, and break his arm in many places, his life only being saved by the strap driving it coming off. If this could happen with a large polished shaft, it is easy to understand how a small one revolving among the numerous folds of a lady's skirt might obtain such a hold as to tear it from the rider's back. No doubt the makers will speedily take steps to remedy this undoubted danger.

The non-success of the "Boudard" gear, which was once so strenuously boomed, is now made apparent by the fact that its £10 shares are quoted in "shillings." The company, under the expert management of Mr. Letchford, once tricycle champion, appear to be devoting their attention to the above speciality.

Two speed gears that have lately been placed on the market do not seem to have made much headway, although in theory they appear excellent. Nothing could sound more rosy than the power of having a low gear for hills and bad going, with a very large one up your sleeve, so to speak, for the down grades and level riding. Many such gears have failed on account of the extra weight and complication; but the principal cause is that the average rider cannot accustom himself readily to any change in the rate of pedalling, and finds the sudden drop or reverse in his gear a positive disadvantage. Some men use them, and strongly advocate their use in the mechanical papers. I have every reason to believe that these opinions are disinterested, not inspired, as is the case with so much matter to be found in literature appertaining to cycling.

The latest gear of this nature now before the public is the "Protean"—the invention of Mr. Linley, of "Whippet" fame. This is not really a new gear, but an expanding chain wheel, which the rider can make larger or smaller at will; it works well, but has the disadvantage that back pedalling is not possible with it; hence the necessity for the rim brake by the same inventor. It also requires a considerable amount of slack chain, which is compensated by a stretching roller on the lower side pressed outwards by a spring.

Of chains. While on the subject of gearing, a few words on the chain itself are indispensable. So much comment has been made, and so many wordy wars waged in the cycling press over the Simpson Lever chain, that I prefer to leave it strictly alone. Personally, I have no faith in it, and, to use the Scotch gilly's comment on a new gun, "for her ain use she would prefer another." The ordinary run of chains may be roughly divided into two classes—roller and block. The roller in a clumsy form was much used for roadster machines a year or two ago; but its weight and the length of its links were found to be against it, and until the beginning of this season it was relegated to common machines and the cheaper pattern ones of good makers, who had chains of this make in stock, and sought this opening to get rid of them. From a lengthy experience I can vouch for the old roller being by no means a bad chain, and for use on a machine without a gear-case it often wore much better than a block pattern, and certainly ran freer when coated with mud in bad weather than its lighter rival.

The reintroduction of the roller chain is due to the Osmond firm, who, in conjunction with Mr. Appleby, brought out a new and improved form of only half the pitch of the former. In other words, it had two links to every one of the old one-inch pitch chain. This form was found good, and latterly has brought out competitors the twin roller being the latest, which is made on the model of the block chain, with a pair of rollers instead of a block. It has the advantage of being capable of use on the ordinary chain wheels, and my opinion of it is that it is the best chain yet out. Cycle chain is now made with great perfection and accuracy, and, considering the amount of work in it, is very cheap. No ordinary mechanic would care to make one chain which can be bought for about ten shillings for less than a five-pound note, and even then it is a question if he would approach the accuracy in pitch and perfection to be found in the maker's article. The most famous manufacturers of chains are Messrs. Perry & Co., Hans Reynold, the Edie Co., Joseph Appleby, and the Cycle Components Co., who have a speciality—a chain running on pivots, instead of the ordinary circular rivets.

Of gear-cases.

Gear-cases are almost indispensable to the regular road rider. Although often given to rattling and other worrying little faults, they save an enormous amount of wear and tear to the chain and chain wheels. This of course means very much less exertion to the rider. The difference between a clean and dirty chain is from 5 to 10 per cent. in efficiency as regards transmission of power. The saving of trouble to the rider in cleaning is alone worth the extra cost which they entail. They are now to be obtained in a variety of patterns, constructed in many materials, from leather to metal, and with many devices to ensure lubrication. The original, the "Carter," is now recognized as the best, when made as it should be, with felt lining between the tin, and the proper precautions to prevent the escape of the oil and the admission of dust to the interior. Many licences have been granted by the proprietors of the patent, and some of the manufacturers of machines excel in fitting really handsome and efficient cases to their mounts. After the "Carter," the "Groose" is the next most popular case, and is made from japanned leather, tightly stretched on an iron frame, with lacing along the bottom, to enable the cover to be detached for the purpose of cleaning the chain. There are many imitations of this case, some fully equal to the original. One pattern has a celluloid window or panel in the centre. In the writer's estimation, this is no improvement, as it causes the leather to sit badly. Moreover, a filthy chain revolving in a leather box is not an object worthy of constant inspection.

Some cases are made wholly from celluloid, and are both handsome in appearance and effective in use. The only objection is, that the material is not very tough, and when by accident a portion of the fittings get broken, it is not easy to repair; further, the unpleasant fact must be remembered that the composition is concocted from a mixture of guncotton and camphor, with other inflammable ingredients. In the event of the case coming in contact with a match, it might take fire, and if once fairly alight, it burns furiously. Among the best-known makes of gear-cases may be mentioned the "Presto," which is an ingenious tin case, turned out at Wolverhampton; the "Dover," consisting of a handsome case made in black celluloid; and the "Rickmansworth," a good, well-finished leather case, made by a new firm in that town. The leather and finish in the last-named case is of very fine quality, and it is saved from the great evil common to most leather cases—of the hooks tearing out where laced on. The purchaser of a machine with a leather case should satisfy himself that it really is what it appears to be, and not made from American cloth, which has not the wearing qualities, and if stretched at all tight will give great trouble from the hooks failing.

Of mud-guards.

Mud-guards are required in bad weather, if the rider has any respect for his attire. They may be divided into two classes—those made from metal and permanently fixed to the machine, and temporary ones, which are only used when wanted, and at other times removed from the cycle. Of the two, the latter are the best for summer use. At all times the extra windage caused by the use of guards can be felt, and the fixed metal pattern are very much in the way if a tyre has to be removed for any purpose. They are also liable to rattle, and very easily get damaged if subjected to rough treatment. The average weight of permanent metal guards is from a pound and a half to two pounds, while the leather and rubber detachable ones do not average more than half this, and can be rolled up and put in the pocket or valise when not wanted.

On a lady's machine the metal permanent guards are a necessity, and are also used as a fixing for the dress guards. As with gear-cases, celluloid and aluminium are being used, but wood, as used on American machines, is probably the best material for the purpose. If a rider gets unexpectedly caught in bad weather when he has no regular mud-guards with him, a rough pair can often be extemporized from a piece of old Kamptulicon, which can generally be obtained at any inn. Failing anything else, a piece of sacking or sheet of brown paper can be pinned on the rider's back, to catch the bulk of the flying mud. The appearance of this need not be studied, as there is little to choose between it and a coat plentifully mud bespattered.

Steps are fitted to most roadster machines, and *Of steps.*

require no description. They should not be used upon very light machines or for very heavy weights, as they put undue strain on the hub spindle, under great leverage, and may, in the case of a poorly-built wheel, buckle it. Makers rightly decline to fit them on their lightest mounts.

Of cyclometers.

Cyclometers are now almost part and parcel of a machine, when used for touring. They are most interesting little instruments, and well repay the small outlay made and extra weight carried. They are principally of American make, although one really good English-made one is to be had—the "Signal"—which rings a bell every mile. Its cost is about three times that of the imported ones; but if finish and wearing qualities count for anything, it is worth the money. The best known of the American ones are the "Standard," the "Veeder," and the "American." The latter is the most accurate that I have tried. The two former are apparently made to register for an exact-sized wheel, which results in the mileage being over-recorded. This is caused by the fact that, even if the wheel is exactly the right size, the pneumatic tyre compresses to some extent when the rider's weight is upon it, and the effective diameter of the

Through the Traffic.

wheel is reduced an inch or more, depending upon the degree of hardness to which the tyre is pumped. Notwithstanding any amount of care in manufacture and design, a cyclometer cannot avoid some amount of personal error, which will vary with each rider. This should be discovered, and deducted or added to its readings. Some of the American cyclometers are almost dead true, while I found that the "Standard" I used last season was fully seventy yards fast in each mile. The rider is recommended to rub a little tallow around the glass and edges of the casing where the top fastens on, to prevent the wet entering. Few are quite waterproof, and a good shower of rain will sometimes go far towards filling up the works with water, which, if not cleaned out at once, will rust and destroy the small gears.

Of lamps.

Lamps of many varieties are now to be obtained, and the use of them is compulsory, so that they may be reckoned as a *sine qua non* for every rider. The price is a very good gauge of the quality. Anything bearing the names of Lucas or Miller may be taken as the best that can be got at the price. There is no object in choosing one too large, but the rider should not go to the other extreme and buy one of the smallest, which will be found wanting in light-giving qualities, and liable to blow out or get dim when travelling at a good pace, owing to the insufficient space for the air requisite to carry on the combustion of the flame. These very small lamps are only fit for "scorchers." The tourist requires something more substantial, which will give out a strong beam of light sufficient to illuminate the road on a dark night for some thirty yards or so ahead, and show a lampless cart or pedestrian at over fifty yards. If provided with a good cone and parabolic reflector, aided by a lens of proper focus, this is not beyond the powers of any good lamp.

There is an American lamp now on the market named the "20th Century," which burns paraffin oil. It is beautifully made, with coloured glasses interchangeable with the plain ones, for use on fancy occasions. Unfortunately, its handsome appearance is about the only thing to recommend it. From actual trial, I can say that it is not equal in light-giving qualities to one of the medium-sized lamps of either Lucas or Miller, and is very difficult to regulate in such a manner that it does not smoke the reflector. The original paraffin lamp, brought out by Lee, of Bloomsbury, in 1879, was a far superior article in all respects, excepting the outside appearance.

Of bells.

Bells, like lamps, are now compulsory under the local bye-laws. Many cases have been reported in which cyclists have been summoned and fined for being without them or other means of giving audible warning of their approach. The magistrates interpret the law so as to hold that the human voice is not sufficient to comply with the requirements of the Act. A whistle is an article which, although it might save a rider from being fined, would be of little practical use, and the bell is now recognized as the cyclist's signal. Fortunately, that most awful of instruments, the "cyclorn," is dead. It did much to make the use of the wheel unpopular with the public, and used to be the delight of the snob in crowded thoroughfares. Nothing need be said here to revive its unpleasant memories; however, I believe that it is still used in some foreign cities where the populace have got accustomed to its hideous squeak.

With bells, as with lamps, the price will indicate the quality. Cheap bells are no good whatever; they make no sound worth mentioning, and speedily get out of order. The old proverb "penny wise and pound foolish" will apply to their purchase. When buying a bell see that the "dome," *i.e.* the bell itself, is made of metal, and is not a steel-stamping. The former will be found much more penetrating when sounded. If the vendor will unscrew the top so that a view can be obtained of the works, choose one with as few complications as possible, and with large teeth to the rack. Those made with small pinions and little wheels, like a cheap clock, get quickly out of order. The old-fashioned, large, single-stroke bells have now gone out of fashion; but they were efficient, and would outlast several machines. I had one in use for ten years or more without its ever failing me. It was four inches in diameter, weighed about a pound, and on a clear night could be heard for nearly a quarter of a mile.

Of spanners.

A spanner is indispensable for every cyclist, and it is upon its efficiency that the proper keeping of the machine rests. The best kind are those made expressly for the nuts used on the machine, providing they fit perfectly. Unfortunately, this is not often the case, and makers are not so particular about the matter as they should be. There is no reason whatever why only two outside sizes of nuts should be used on a machine, with the exception of the head nut, which could be made with a milled edge, and with tommy holes to start it if stuck beyond finger power. The old Humber Ordinary machines were made on this plan, and it is a pity that other makers have not followed it; however, the American makers have recognized its advantages, and now have applied it to their machines. Owing to the different sizes of nuts, and the lack of properly-fitting fixed spanners, many makers send out adjustable wrenches with their mounts, and it is advisable for every cyclist to have one by him. The number and names of all the different kinds on the market are simply legion, and, with a slight alteration, the opinion of the Sage of Chelsea on mankind would not be an unappropriate description of them, "Mostly bad."

There is, in my idea, only one really good serviceable adjustable wrench on the market; that is the "King Dick," made by the Abingdon company. There are a multitude of copies, and the buyer should see the trade mark (a bull-dog and the word "Abingdon") on each; the price is about half a crown.

Having now given my readers a summary that should help them in the choice of a mount, only a few general points remain to be discussed. The reader will naturally ask, "What should a complete machine for my purpose weigh?" If he is wanting a full roadster, complete with gear-case, mud-guards, roadster tyres, and a good brake, he must not expect to get it much under thirty-two or thirty-three pounds. If, on the other hand, he is content with road-racing tyres, and will dispense with the mud-guards, a serviceable mount should not scale over twenty-eight. Stripped of the brake and gear-case, and with the same tyres, but built a little lighter, a good machine can be turned out about twenty-four pounds or less according to size. These weights are those which by trial I have found to be sufficient to allow of the best workmanship being applied to every part, while sufficient strength is allowed to ensure perfect safety in ordinary road riding.

Of ladies' machines.

Ladies' machines are naturally heavier than those for men, on account of the inherent weakness of a frame built to allow the skirt to fall and cover the ankles. If a machine does not weigh over twenty-eight pounds with lamp, tool-bag, etc., included, it is light. They can be easily made to this weight; but the bulk of the English machines run two or three pounds heavier. The reason for this is that the makers fear the use of the machine by men, for it is a fact that ladies' machines are often used by the sterner and heavier sex, who find them easier to dismount from, and appreciate the lower saddle when learning.

The only point not included in the foregoing hints in which ladies may take an especial interest is the design of the frame for their use. Should they select one with straight or with curved tubes? Some ladies appear to ignore the question as to which makes the best and strongest machine, and discuss the matter in precisely the same way as if they were choosing a new costume. Will the pattern suit their figure? On this delicate point I do not pretend to be a judge; they must settle the matter to their own satisfaction. I can only advise on the relative mechanical merits of the respective frames, though on this I am myself rather doubtful. My fancies lean to a curved tube for the upper one in the frame, providing it does not join the diagonal tube at a point too near the crank-bracket. The favourite place for ladies' machines to fail is in the region of the crank-bracket, and it is here that the greatest stress is put upon the tubing. Sometimes the bottom tube cracks off close to the lug, or the diagonal tube parts just above its joint with the top tube of the frame. If a frame is well-lined and trussed in these points, such sources of weakness are to a considerable extent removed. If there is no strut between the top and bottom tube of a frame, as is common on some of our best makes, it is possible to feel the give-and-spring in it by putting a finger between the two tubes and leaning heavily on the saddle. The two at once close up, and a smart pinch is experienced. Whether this spring is a disadvantage or not is a point open to argument. It certainly eases the shock to the diagonal tube; but, on the other hand, it tries the bottom tube severely.

Of second-hand machines.

Second-hand machines require the opinion of an expert to gauge their value. It is now a regular custom for a number of shady people to make a very good living by retailing new and shoddy cycles as second hand. These are made simply to sell, and are often the most awful rubbish which can be put together. Even the tyres are frauds, being the commonest single tubes in Dunlop rims and with Dunlop valves, and corrugated covers to represent the best makes of detachable tyres. The machines themselves are made equally badly in every hidden part, being nicely enamelled and plated so as to deceive the unwary. After being finished they are ridden for a mile or two over muddy roads, and then advertised as the property of a widow, whose son has been killed in the Transvaal or in some other harrowing manner. Any constant reader of the advertising columns of the papers who devote space to bicycle sale and exchange must notice the frequency with which such advertisements appear, with a little different garnishing, from the same addresses. It would be interesting to know how many cycles some of these widows' only sons had—probably hundreds if the truth were known.

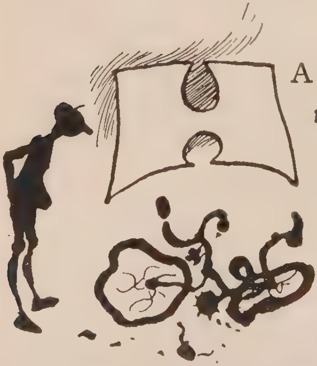
Although there are as many sharks and thieves dealing in second-hand cycles as in horses, it is still often possible to pick up a genuine machine at the end of the season at about one-half of its new value. If no expert aid can be got, the buyer should trust more to the name on the machine than anything else. He should, further, satisfy himself that the tyres are in good order, taking out the air tubes and seeing that the canvas lining of the covers is sound. A few punctures in the air tube are of no consequence whatever so long as the covers are sound and the tubes themselves have no signs of bursts or badly-frayed portions. The spokes must be sound and of even tension and the wheels run truly; the bearings tight, yet at the same time allowing the wheels to revolve for some minute or two when spun in the air. Examine the back chain wheel and see that the teeth show no great signs of wear; if the machine is an old one, it is likely that the teeth will be nearly worn off and the chain badly out of pitch. See that the cranks and pedals are straight and that the forks are truly in line with the steering post and not set back, which will be the case if the machine has at any previous time been in collision. It is from such small matters that an expert at once forms a pretty correct opinion of the value of a second-hand machine, and is able at once to tell the year of make and to judge how a machine has been treated. The mere size of a nut or machining of a single part will often show him that the machine is but a copy of the make it represents to be.

If the buyer should know the history of the machine, he will, of course, be able to deal with confidence, and then the deal resolves itself into a mere arrangement over the price. Such a machine should not be allowed to slip by if suitable. It will be found to give far more satisfaction than the unknown quantity offered by a stranger, and is infinitely preferable to a new but cheap one.

CHAPTER V.

HOW TO KEEP A MACHINE IN GOOD ORDER.

Where to keep a cycle.



HAVING obtained a machine which embodies all that the rider fancies is required in an ideal mount, it is of the greatest importance that he should treat it properly. Otherwise it will soon not only lose its handsome appearance, but deteriorate both in ease of running and general efficiency. The first step is to discover a proper place for storing it. Many riders are content to have their machines placed in a damp stable or outhouse, where not only is moisture present in abundance, but the machine is subjected to the ammonia fumes arising from the customary refuse found where horses are kept. If nothing worse happens the nickel plating and saddle will suffer from this treatment. Eventually the canvas lining of the tyres will rot, and it is quite possible that the heads of the spokes will become so rusty as to cause breakages. A thoroughly dry place must be found for an expensive machine. Never forget that it requires nearly as much care as a good gun. What can be more foolish than to spend twenty pounds or more on a cycle, and then to let it go to pieces for want of a little care? If room cannot be found in the house, see that the building in which the machine is kept has a good floor and is reasonably dry. If a cycle shed is specially erected for the purpose, it should be lined with tarred felt, and the floor raised some six inches or so from the ground. It is hardly necessary to add that the building itself, if near any great town, requires to be substantial, the door strong, with a good lock, and possibly an electric alarm as an additional security. The house-breaking fraternity have already found out that cycles are fair game; often to be easily stolen, and, what is worse for the owners, seldom recovered. There is no doubt that regular depôts exist for the reception of stolen mounts. Accomplices are ready with all the necessary tools, and, once captured, a machine is speedily transformed by the exchange of parts from other stolen machines until its owner would not be able to recognize it. Probably not one in a hundred of the missing machines are ever recovered. This fact should impress upon cycle owners the necessity of looking after their property. It is as true as ever that there is no use in locking the door after the iron horse is stolen.

Cycle stands.

Having decided upon a store for the machine, a stand of some kind should be improvised. Probably the best plan of all when circumstances permit is to sling it by two cords from the roof with a couple of leather-covered hooks; one to go under the rear of the saddle, and the other to slip around the handle bar at its centre. From this description any blacksmith will be able to make the hooks. The leather, or for the matter of that any soft fabric, can be wound round them in strips and tied at the ends. Where this plan of slinging the cycle is not feasible, one of the regular cycle stands can be bought at any depôt. The rider can, however, improvise one for himself by nailing a piece of wood against the wall, with a big notch in it for the front wheel tyre to fit into, and fixing a pair of blocks on the floor to prevent the machine running backward—a pad being placed against the wall where the handles rest. This plan necessitates the machine being put in a corner of the building, which is probably the most convenient place to store it. To prevent it falling outwards if struck by accident, a small piece of cord with a hook at the end can be made fast to a staple, and the hook attached to the saddle pillar. This precaution is advisable, as a fall on a hard floor will often sadly mar the handles, or, in cases of very light machines, bend the cranks and help to put the frame out of line. One fall, be it always remembered, often does more damage than months of fair usage.

Lubricating oil.

Oil for the bearings and lamp requires more than mere passing notice. For the bearings it is highly essential that the lubricant be good. Often riders use anything which comes to hand, no matter whether it was originally intended to assist the growth of the human hair or to mix the colours of painters. Then they appear astonished if the machine goes heavily. I have had machines brought to me in which a kind of oil made especially to set hard on exposure to the air has been used. On one occasion this oil had been put into the Carter case, with the result that it set into a substance as solid as horn, and defied all efforts to remove it until the chain, and balls from the bearings, were boiled in a solution of caustic soda.

Lubricating oil for cycles should be very thin, as its function is not so much to prevent friction as to keep the bearings clean and free from rust. If thick it will actually add to the friction, as the rider can find out for himself by trying the experiment of spinning a pedal with the balls clean and dry, and afterwards lubricating them with either thick oil or vaseline. At the same time a thick lubricant is an advantage for some parts of the machine, such as the head. It lasts much longer than the thin, and does not allow the dust or wet to enter. The head when put together with vaseline will run a season without further attention. A little vaseline is also very useful to prevent rust on the nickel-plating, and should be rubbed over the plated parts when the machine is to be laid by for any length of time. It never sets or goes hard, and can be wiped off with a rag. It is extensively used by makers when despatching new machines from their works. The best oil for use in the bearings is pure sperm, though it is almost impossible to obtain it. Failing this, good mineral oil is nearly as effective, and can be bought at a very much lower price. White's "Electrine" or Miller's oil are quite suitable for the purpose, and can be got at any cycle store. Riders should avoid oils sold as suitable for both burning and lubricating. The only one which will do this effectively is sperm, which, now that it is so scarce and dear, is not likely to be found in the compounds sold for this purpose; the price would prohibit its use.

Lamp oil.

For the lamp many oils can be obtained, all more or less suitable. Colza does very well; but the best is the ordinary olive oil with which we are already acquainted in salads. This will give a better light and smoke less than nine out of ten of the oils sold expressly for cyclists' use. It can be got anywhere where there is a grocer's shop.

The lamp.

While on the subject of oil, the lamp can be discussed, and if the rider does much night riding it behoves him to keep it in a perfectly efficient state. It will render travelling more pleasant, and do much to minimize the dangers of the road. The reflector and glass should be kept clean and well polished with either rouge or whiting. The former is the best, and an ounce, costing sixpence, will last years. The reservoir for the oil must have any leakage wiped off and the wick trimmed from time to time. When a cotton wick has been long in the oil the pores become choked up, and the capillary action either ceases, or is not sufficiently rapid to supply oil to the flame. The result is that the cotton itself becomes charred and burnt up, and the light gets low and goes out. For this reason it is advisable to frequently change the wick. This deterioration in lamp cottons is especially noticeable when the lamp has not been used for some period. If in constant use the cotton can be burnt down to the last inch. Lamp cottons can be purchased at most cycle depôts. It is important that the correct kind be obtained, as the cotton sold at oil shops is of too close a texture to burn heavy oils, being intended for paraffin, an oil which is quite unsuitable for cycle lamps. On no account should either this or benzoline spirits be used, excepting in those lamps which are especially constructed for the purpose, such as the "Moonlight Vapour" and the "20th Century." I have a distinct recollection of seeing one of the old Ordinary bicycles enveloped in flames owing to the owner having charged his lamp with benzoline, and the fire was not extinguished until after considerable damage had been done. It was only finally put out by a bucket of water borrowed from a neighbouring house. It made enough noise, smoke, and sensation in Hamilton Terrace, St. John's Wood, where the accident happened, to rival a modern motor car. What intensified the mischief was the fact that the lamp, one of the old hub sort, could not be removed from the machine.

The bearings.

The bearings of a machine must have attention occasionally if they are to be expected to run smoothly and endure prolonged wear. Here a "stitch in time" well saves the nine, and neglect is the cause of many a bill at the repairers'. An oiling for every 150 miles ridden is sufficient, and then only a very little is wanted. If the machine is put by for any length of time, or if it has been in the rain, it should be oiled before it is taken out again. In the latter case the oil will help to work out any grit which has found its way into the bearings, and prevent the moisture from rusting the balls. If attention is paid to the lubrication of a machine, the bearings will not require to be opened out oftener than once a season. If the rider is not certain of his ability to perform this operation, he can substitute the following plan for cleaning, which is very fairly efficient. Loosen the adjustment until the wheel is quite loose, then squirt plenty of paraffin oil into the lubricator and allow it to run through the bearing while the wheel is being revolved. This will bring away much of the old clogged oil and dirt. But remember that oil of any nature, especially paraffin, is very destructive to indiarubber, and take care to let as little as possible get on the tyres. On this account this system of cleaning and oiling is more suitable for the pedals and crank bracket than for the wheel bearings. I have often thought it would be an improvement if a screw plug were fitted in the bottom of the bracket to facilitate the operation.

All bearings wear away and require adjustment at some time. If this is not done, the cones on which the balls revolve will wear oval and the shake become chronic, causing the bearing to get in such a condition that it cannot be adjusted properly. It will be quite tight, and yet, when revolved for a portion of a turn, become just as loose. To adjust a bearing is a most simple matter—loosen the lock nut, which, in case of the wheels, will be on the left-hand side, and will be the same nut as secures the spindle or axle of the wheel to the frame of the machine. Then give the cone inside the frame a portion of a turn in the same direction as the hands of a clock move — about one-eighth of a turn will be enough. Do not overdo it, or the wheel will run stiffly. Tighten up the nut, and try if any shake is noticeable. If none exists, see if the wheel is free. It should oscillate like a pendulum if all is right, and eventually take up a position with the valve of the tyre at the lowest point. It is better to have a trifle of shake in a bearing than for it to be too tight. Remember that if the circumference of the wheel can be moved from side to side for, say, a thirty-second of an inch, it only represents something under one-hundredth of an inch of actual play in the bearing, which, although a large amount in engineering, is near enough for cycling work. The adjustment for cones is sometimes provided with a milled head, to be screwed up by the fingers; others have two flats, which take a thin spanner, generally provided with the machine; and some simply have small tommy holes, into which a piece of spoke wire or French nail can be inserted to turn them. The cones on crank-brackets either have flats on them for a spanner, or else holes in pairs, for which the makers should send out proper spanners; but more often these are not to hand, and as the distance between the holes varies with nearly every machine, the rider or repairer has frequently to make use of a punch to adjust or remove the cones. For this a common French nail does well; it is softer than the steel, and will not mark it. A few light blows of a tack hammer is enough to move them. The same remarks apply to those head-nuts which are made on this plan. The head requires most careful adjustment. If allowed to remain loose, the very small balls used in it—often no more than one-eighth of an inch in diameter—will override the ball races, and, by getting a leverage on the thin top edges, crack pieces out of them, so that when the machine is brought in to the repairer he has no alternative but to replace them. This means that often he has to write to the makers for new ones, most local men not having the facilities for readily turning them from a bar of tool steel.

The pedals.

Pedals require the same care as the bearings, but often are so badly made with soft cones on the pins, that no amount of care will prevent them wearing into flat places just where the thrust comes. Now that the weight of pedals has been reduced to the absolute minimum, the wearing qualities have suffered, and it is seldom that a pair are found that give the lasting satisfaction afforded by the early ones, such as those made by Dan Rudge himself. The modern machine tries pedals severely. All the grit and mud is thrown on them, owing to their being so close to the ground. It is only recently that makers have discovered the fact that they require more protection against this destructive action than was the case on the old high machine. For winter use, vaseline is to be preferred to oil for all pedals. Although it makes them run a trifle less free, it keeps the wet out of them, and prevents the balls rusting, as they will do when oil is employed. So much wet often gets into the bearings as to wash out a thin oil in a very short time.

Chains and gear-cases.

The chain is one of the parts of a machine which receives least attention, although it really requires as much as any other. A little thought will convince any one of the truth of this fact. There are in a chain of ordinary length about one hundred and ten working joints, each one of which comes into action every time it runs over either chain wheel, often with a pressure of over a hundred pounds on it. If these little joints are not properly lubricated, they cause a large amount of unnecessary friction. Here it is that the beauty of the Carter case, with its oil bath, is to be noticed. Not only are the joints of the chain properly lubricated, but a film of oil is interposed between each link and the surface of the cog-wheel, allowing it to run much more freely than when dry and covered with grit. Some advocate the use of plumbago, or black lead, for chain lubrication, which to me seems a mistake. It should only be used on naked chain as an addition to oil for the outside lubrication between the teeth and the links, and not to lubricate the rivets. It is true, when no gear-case is used, that after the chain

THE CLOSE OF A SUMMER'S DAY.—"FAGGED."

has been well oiled and the surplus grease wiped off dry, a good rubbing with a black-lead brush will improve matters; but to trust to it alone will soon cause the rivets and blocks to wear and get out of pitch. If the weather is wet, black lead is no protection whatever, and the chain will rust and get very stiff. I have known a new chain to get hot and bind so much that the rivets became fast in the blocks, with the result that the chain was ruined in a few days. If a gear-case without an oil bath be used, it is advisable to take out the chain every three or four months, and soak it in paraffin oil for a night, afterwards hanging it up for an hour to drain, then repeating the process for an hour in thick lubricating oil. Otherwise it can, after being well cleaned in mineral oil, be dipped in melted tallow. It will thus absorb enough between the links and rivets to run for a long time.

The Carter case requires to be cleaned out occasionally. It is necessary to do this oftener with that pattern known as the "Detachable Case," for this is not so dust-proof as the older one known as the "Fixed Case." Every three or four months is about the time to do this with the former, and once a season with the latter. Although all the joints of the case may appear quite tight, it is surprising how much dirt, and often water, gets in. This does not appear to do the slightest harm ; the dirt is to be found caked together in almost a solid mass at the bottom of the case, with the water, if any, under the oil ; while the chain itself is quite clean and free from grit, covered with a nice film of oil, generally more or less discoloured. Cleaning chains is one of the most disagreeable operations connected with the proper keeping of a machine, and my advice is to get a small repairer to do it when possible. If the rider prefers to do the work himself, and has any respect for the colour of his hands and clothes, he should don the most ancient garments he possesses, and provide a basin of clean paraffin in which to wash his hands after the job is done. This is the only substance which will remove the filthy grease from the pores of the skin, and paraffin oil can be easily washed off with a little hot water and plenty of soap. Engineering students will fully appreciate this point.

It is one of the drawbacks of all chains that they are apt to stretch in use. They require attention when this occurs to any great extent. The elongation can be discovered either by the feel when pedalling, or, if a case is used, by the rattle of the chain as it comes into contact with it. Means are provided by the makers for adjusting the chain. They take the form of either two notched plates hinged eccentrically on the axle, or, more commonly, two eye-bolts, with a small nut at the end of the slot in the compression stays. To adjust the former, loosen both nuts on the axle, and then pull the wheel backwards until the chain is nearly tight, revolving the plates at the same time until one or two notches have passed the small set screw into which they engage. To adjust the latter, loosen the axle nuts as before, and then take a few turns of the small nuts on the end of the bolts until the slack has been taken up. Care must be taken that the chain is adjusted equally on each side, so that the tyre is midway between the stays and back forks of the machine. If this is not done, the machine runs crabwise; instead of each wheel following in the course of the other, two tracks are made. In extreme cases the tyre will rub, and soon be cut into a hole by coming in contact with the sides of the stays.

A chain does not require to be absolutely tight, but runs far better when only moderately so, with a distinct curve on the lower side. If the chain has to be removed for any purpose, the rider must be careful to replace it in the same position as when taken off. If it be turned round or reversed it will most likely make a clicking sound, and run badly for a long time. Also the small lock nut on the screw pin connecting the ends must be well tightened, or it may work off and allow the pin to come out, with consequences which may be awkward to the rider should it happen on a decline and no efficient brake be at his disposal. If the chain comes off inside a gear-case, the whole case will most likely be completely wrecked. I well remember a chain coming loose on a machine I was riding when I was sailing away at a great pace down a long hill. It tore the gear-case to pieces in an instant, and then tied itself in knots round the stays and the spokes of the rear wheel, locking it so that it could not revolve. It took me nearly two hours before I could get it loose and straighten the bent links so that I could ride home. The most remarkable thing about this *contretemps* was that not a single spoke broke, and no trace of damage could be found on the tyre, although I am certain it ran for some dozen yards or so skidding. The gear-case—one of the leather variety—was a most hopeless mess, and the shreds of leather and the iron frame, tangled up with the chain around the back cog, made the task of cutting this Gordian knot no enviable one. I have always been exceedingly careful about locking chain pins since that occasion. If no lock nut is provided, and one cannot be obtained, or there is not room for it in the case, the end of the pin must be "burred" up, by holding a heavy hammer or weight on the side where the head is, and gently tapping the projecting screwed end with a lighter hammer. A few blows will be enough, and the rider can test the efficiency of the job by trying to unscrew it. If it goes hard, it is enough, for sufficient thread must be left to allow of the operation being repeated at some future time. To remove a chain "burred" up in this manner, the end and edges of the screw should be eased a trifle with a fine file.

Saddles.

Saddles want but little attention; a very little castor oil applied to the inside of the leather once in a season will keep them pliable and prevent cracking. If there is any joint about them, a little oil will be an advantage. Saddles often develop squeaks, and the rider is at a loss to locate them, fancying that they come from the machine itself, while the real culprit goes unsuspected. When you find out your mistake, drop a spot of oil on the forward hook, and also between the coils of the springs if they touch anywhere, as is not unfrequently the case.

While on this subject I may say that indefinable squeaking is often a great nuisance. If oil applied to the usual bearings and saddle give no relief, try the break lever and the rod; the slight vibration will sometimes cause enough movement to set up friction and make noise. Lamps often are inveterate "squeakers." It is always the same part, the hinged back, which, when made with metal joints, requires oil like any other wearing surface. Lucas and some of the other makers put india-rubber packing into the lamp joints, and I hardly need say that this should not be oiled. If there is a metal spring sliding upon any part, it should also have an occasional drop of oil.

Spokes. Should a spoke break at any time the rider should take the very earliest opportunity of having it replaced. It at once throws greatly increased strain on those adjoining. Sometimes if repairs are delayed more breakages will follow, until the wheel assumes a shape like a figure of eight, and is said to be "buckled." A single spoke snapping in a solid rim often throws it very much out of truth. In a good hollow or wood rim it makes but little difference. It is advisable to run the fingers round the wheels sometimes and try if all are tight; if any are decidedly slack let the machine go to the repairer before worse happens.

Cranks and pedals.

Cranks and pedals have a knack of getting loose occasionally. They should at once be tightened up, or damage will ensue. Cranks are very easily tightened if properly fitted. A weight has to be held on the side where the small nut is fixed on the cotter—not on either the nut or cotter itself, but on the portion of the crank adjoining it; a few taps of a light hammer will drive the cotter-pin through a little further, and its wedging action will put matters straight. The small nut has to be tightened afterwards to prevent the cotter-pin working back into its old position. If cranks do not receive attention when slack, the flat on the axle gets rounded, and the cotter itself gets worked out of shape so that a new one will be required. If the cotter drives through so far that the nut cannot be screwed down, a loose washer or two may be added under it to make up space. Owing to the hurry and push this year at all factories, badly-fitted cotters have been sent out in hundreds, and many cranks have gone wrong. Loose pedals sometimes give a lot of bother, especially if the rider has not taken them in hand in time. The thread wears out of shape, so that it will not hold for any length of time; and many of the fittings now used by makers require more powerful tools than an amateur possesses to pull them up tight when loose. Hence it behoves one to seek professional aid when the rider finds his efforts futile. I use the B.S.A. style of screwed-in pedals; and, to make sure of their holding fast, use a powerful ratchet brace with a very tough screw-driver, which gives such a grip that unless purposely loosened they hold very well.

Brakes. Brakes must be examined, after much riding, to see that the blocks are not so worn as to allow the tyres to come into contact with the metal framing or rivets. If this is not attended to the unprotected sharp edges of the metal will work havoc with the covers. Most brake blocks are now made interchangeable, and it is a good plan if the machine is going to an out-of-the-way place to carry a spare set of blocks.

Handles. Handles sometimes work loose on the handle-bars; but by removing them carefully and rubbing on a little tyre cement, elastic glue, or, if the others cannot be obtained, even resin, while the end of the bar is hot, they can be readily secured. After the handle has been again slipped on, any surplus cement should be wiped off with a rag, and the ferrule of the handle and the adjacent parts of the bar cleaned with a little benzoline or naphtha to remove the last trace of the cement. In half an hour the bar will be cool and the handle set ready for riding.

Mud guards. Mud guards when loose often develop rattles. This can be easily cured by unscrewing the bolts which hold them in position and putting a little leather under the loose part. This will so cushion them that they will remain permanently silent.

Cleaning. The best material to clean nickel plating is a red substance known as extra fine crocus powder. Whiting will not affect the tarnishing, and, as I have been told by platers, tends to discolour it. This material can be obtained from the platers, but is not easy to get, excepting by order, from local tradesmen. Powders sold for polishing silver plate and plated articles are quite useless for nickel, which is a very hard metal and wants a substance as fine as flour with the cutting properties of emery. I have often noticed that after being out in the rain for any length of time the plating always comes up much brighter than usual.

Enamelling only wants such care as would be given in cleaning a carriage or other painted article. Just wipe the dirt off it with a clean sponge and water, and polish with a dry cloth. If the mud is rubbed off dry, scratches will ensue and the appearance be eventually spoiled. I need not remark that buckets of water should not be thrown over a machine.

CHAPTER VI.

THE HUMOURS OF CYCLING.

By Gilbert Floyd.

IN common with all pursuits that carry us forth into the highways and byways of the world, the sport of cycling brings us into contact with the chequered lights and shadows wherewith the path of life is dappled. With the lighter side of cycling only does it fall to my lot to deal. The intelligent foreigner—possibly from the study of our music halls—imagines that the type of English humour is a knockabout entertainment. Whether he be right or wrong in his opinion, it is certain that most of the humour of the sport in question is derived from the thousand and one little accidents and vexations that are entailed in its pursuit. True, the clouds that obscure the cyclist's vision are seldom without their silver lining; the troubles, mechanical and otherwise, that arise on the road are of a description to foster patience and consequent philosophy in the breast of the sufferer. In the very bursting of a tyre—direst calamity of cycling existence—the philosophic cyclist can find amusement, especially if the machine of a friend is the offender. Nobler still, a man of iron nerve can in time bring himself to laugh at his own misfortunes, and thus prove himself the victor of outrageous Fortune, since he is independent of her smiles or frowns.

The first to discover the wealth of humour that lies hidden in the wheel was the ubiquitous small boy, whose efforts, combined with the spread of cycling to fashionable circles, have at length brought its treasures under the notice of our national museum of humour—to wit, *Punch.*

The crude wit of the small boy is distinctly conservative when applied to the wheel. The epigrammatic cry of "Monkey on wires!" and the obvious yet startling announcement concerning the revolution of one's wheel, wherewith he greeted the advent of the earliest cyclists, still find first place in his vocabulary of humour. Still are such efforts as these, endowed with the perennial freshness begotten of many generations of youth, fired off at the expense of the present-day exponent of the art of cycling. Indeed, the introduction of pneumatic tyres, and the revolution brought about by them in the pastime, scarce tempted the small boy, even by their tempting suggestion of "steam-rollers," from his allegiance to the above-mentioned ancient and time-honoured greeting. Even the subsequent startling innovation of the tandem bicycle needed the stimulus of that popular music-hall song concerning a "bicycle made for two" to arouse any fresh comment on his part.

Not unnoticed amongst the numerous aspects of cycling, by the philosophic mind, is the strange manner in which it has sprung into popular esteem.

An essentially plebeian pastime in its early days, despised and rejected of all but its humble disciples, it became the sport of kings, and even queens, with a celerity and completeness suggestive, above all things, of a Gilbert and Sullivan opera. Many cyclists will recall the sudden transition and revulsion of feeling brought about by this strange state of things in the breasts of their non-cycling acquaintance. Elderly fathers of families, who had hitherto regarded the sport as a sort of Sunday morning recreation for shopboys, suddenly discovered that the cycle was the one thing needful for the successful regulation and permanent adjustment of the paternal liver. Mothers, forgetting all previously-formed conceptions of the impropriety and immodesty begotten of participation in the sport, hastened to provide themselves and their daughters with the dresses and equipment necessary. Their less conservative sons and daughters did not fail to encourage the new craze. Cycle factories and schools sprang into existence to supply a demand, which has not yet begun to fail. A new language was evolved; discussions on bikes and punctures, handle-bars, and two speed gears, usurped the place of the customary small talk of afternoon tea-tables.

According to statisticians, the marriage rate of the British Isles, which for some years previous to the cycle boom had been steadily declining, started to ascend with renewed vigour under the match-making influences of the wheel. Fat people resorted to cycling to decrease their weight, whilst thin people loudly proclaimed the merits of the wheel as a means to the attainment of more rounded proportions. Booms in cycle factories and cycle shares robbed even the mining markets of their lustre, and resulted in the evolution of the cycle millionaire, who after the customary canter in the political and philanthropic arena, will, in the due course of time, surely expand into the cycle peer. With him, the cycle millionaire has brought litigation, and the cyclist has been treated to the rare sight of Her Majesty's judges struggling with those same intricacies and technicalities of pneumatic tyre construction, the mastery of which has cost him so many hours of bitter experience and perspiring labour.

What a wealth of material for a comic opera has been lost in the stern reality of this vast epidemic of "cyclomania" that has set all the world to disport itself awheel!

The comic element of cycling life presents itself at the very outset of a cycling career, as the first plunge into the troubled waters is seldom premeditated and prepared for by the tyro. Looking backwards, in few cases can he really recall by what method of reasoning he became the purchaser of a bicycle. In a psychological moment, big with fate, his eye is caught by the tempting glitter of burnished metal, proceeding from the window of some cycle show-room. He vaguely calls to mind the fact that many of his friends and acquaintances are enthusiastic cyclists, and by a subtle and mysterious mental process, a preliminary symptom of the epidemic "cyclomania," his brain involuntarily suggests to his non-cycling "ego" that he too should follow their example.

"I become aware of a large number of cycles of all descriptions, artistically displayed behind the polished expanse of the plate-glass window," as Walt Whitman would describe the sensation he experiences. Attracted by the pleasing lines of their graceful framework, the grotesque swelling and marking of their rubber-shod wheels, and the soft æsthetic tint of their multi-coloured enamelling, he pauses awhile to inspect them.

Then, with a strong mental reservation against purchasing, and a general idea that he is merely satisfying the idle curiosity that begins insidiously to work within him, he enters the show-room.

He is received by an exceedingly amiable and well-dressed attendant, who, without any apparent design, soon succeeds in convincing him that he lacks one thing necessary to fill the cup of his earthly happiness to overflowing, in that he has not as yet become the possessor of one of the world-famed productions of the, shall we say, "Chinatown" Cycle Corporation Limited.

After a faint endeavour on the part of the victim to argue that the possession of a "Chinatown" cycle is not absolutely essential to his very existence, and that to live "through fifty years of Europe" is decidedly preferable to sudden death on "a cycle of Cathay," he gives way to the insidious influences of his growing passion so far as to make a mental selection of the machine he would choose were he an intending purchaser. Having given way, though only in the slightest degree, to the strange feeling of nervous unrest that is at work within him, a rapid development of the cycling neurosis follows.

The machine his mind has selected holds him beneath a spell of fascination, not unlike that unpleasant sensation, known amongst football players and other barbarians as "being winded," which often attends the first dawning of love's passion within the breast of youth. Of course he has seen thousands of cycles, but hitherto to his untutored eye a cycle on the road, a simple cycle was to him—and it was nothing more. But how different from the vulgar crowd appears this particular machine! How strong, yet how fairy-like, are the tubes that compose its frame-work! How cunningly contrived are the lubricators destined for the reception of the ease-imparting oil! And, above all, how captivating to the eye is the glossy blackness of its polished coat of enamel!

The attendant, who now throws off all disguise and appears as Mephistopheles in a frock coat, whispers in the ear of poor Faust, chanting the praises of the machine, which for the moment assumes the *rôle* of Marguerite. He discourses on its strength, its rigidity, its speed. He grows eloquent upon the matchless perfection of its design, and the years of toil and brain-racking invention that have been bestowed upon the evolution of its bottom bracket bearing, most dust-proof and most mechanically perfect of all the triumphs of human ingenuity in this direction.

The victim listens, bewildered by the jargon of unintelligible technicalities that pours from the tempter's lips, yet undecided, for his thrifty soul is yet struggling against what it feels to be a piece of unjustifiable extravagance. Then the pretended shopman plays his last unfailing trump card, by hinting how a certain gentleman, mysterious as Sairey Gamp's familiar spirit, Mrs. 'Arris, is also enamoured of that selfsame machine, and is expected, in the course of the afternoon, to arrive with open cheque-book, that he may bear it away in triumph.

A storm of jealousy sweeps over the already wavering soul of the listening victim. "Who's this man?" he asks himself, "that he shall carry away such a pearl of great price amongst machines before my very nose? Perish the thought!" And thus the last barrier of his prudence is overturned. He produces his note-book, purchases wildly the lamp, bell, and other accessories that form the trousseau of his new helpmate. In a few seconds, by some mysterious agency, evidently of diabolical origin, he finds himself deposited with his new purchase on the pavement outside the shop, the poorer by twenty-three pounds ten sterling, less 20 per cent. discount for cash, and the richer by a "Chinatown," Model A, road-racing safety bicycle.

Bewildered by his new possession, he stands there, gazing helplessly at the surging stream of foot-passengers that bars his progress. Then, for the first time in his existence, does he begin to realize and sympathize with the many trials to which cycling flesh is heir, and to feel the first dawning of that mysterious feeling of companionship in adversity, known, to those who have experienced it, as the "freemasonry of the wheel." "Sye, guv'nor, shall I 'old 'is 'ed for yer?" inquires a street boy, with the terrible satire of his kind, as he pauses in his whistling career to form the nucleus of an admiring and expectant crowd of the "submerged" tenth, which, rising like Venus from the waves, gather around in anticipation of a performance of an acrobatic nature; for which, moreover, there will be nothing to pay.

To the initiated the propulsion of an unburdened bicycle would appear the most simple action in the world, but to the neophyte the proceeding is fraught with dangers and confusions innumerable. Agitated and disturbed by the gathering crowd, our friend receives his first intimation of the hitherto dormant vices of the modern safety bicycle as he attempts to wheel his purchase homewards. It comes in the shape of a spiteful kick on the shin from an exceedingly spiky pedal, followed by an excruciating hack on the ankles from the same instrument of offence, which, much to the amusement of the stony-hearted following of street urchins, brings tears of mingled pain and vexation to his eyes.

Still further does he realize the callousness to suffering of the world, from a cycling point of view, on making his first acquaintance with that natural enemy of all cyclists, the police-constable. That functionary swoops upon him like a sparrow-hawk on its victim, takes his name and address, and then proceeds to enlighten him in a peremptory manner concerning the pains and penalties attached to the heinous crime of wheeling a cycle on the sidewalk. With a spirit rapidly breaking under the series of adverse circumstances, our friend at first feels inclined to return to the haven offered by the show-room, that he may request the salesman to send his new treasure home by the prosaic hands of the carrier. But, stimulated partly by a feeling of pride, and partly by a lurking fear of allowing himself to be inveigled into a further purchase, he plucks up his courage, and plumps into the shifting maze of Juggernaut wheels, the terrors of which almost outweigh those caused by the lurking presence of the hostile policeman. Hitherto he has been possessed of the idea that the bicycle belongs to him, but as soon as the untamed wheels feel the smooth surface of the roadway, he becomes unpleasantly aware of the fact that it is he who belongs to the bicycle. He dimly remembers a remark of the Queen of Italy, who, having been deposited by her cycle at the feet of a sentry at the palace gates, cheerfully remarked to the soldier, "I thought I could do what I liked with my own, but now I find my own does what it likes with me."

With a vicious wriggle and shake of its handle-bar, it dives into the traffic, dragging its terrified owner into the proximity of grinding wheels and clattering hoofs. His nervous hands are powerless to restrain its startling eccentricities.

With the rush of a freshly-hooked salmon, it dashes from kerb to kerb with a joyous and reckless disregard to the rules of the roadway and the personal safety of the terrified and subdued owner. Breathless and perspiring, he awaits his doom in sullen despair, closing his eyes now and again as it drags him into the midst of heavy-laden dray wheels, receiving in Spartan silence and heroic meekness the objurgations bestowed on him by infuriated 'bus-drivers, constrained to drag their teams on their haunches as he stumbles from beneath the horses in the wake of his now thoroughly unmanageable machine.

"Great heavens!" he exclaims, as, panting and perspiring, he is dragged along like a captive at the chariot-wheel of a Roman general, "if the art of wheeling a bicycle be so painful in its acquirement, what of the art of bestriding it?" His coat is stained with mud from the surrounding vehicles, whilst his trousers are torn and draggled by the remorseless pedals. An unconsidered and helpless straw, he drifts on the cruel tide of the great traffic stream, till at last, his pride broken by much bitter experience, he accepts the proffered salvage operations of some vigilant cabman, who has espied his signals of distress, and bears down to his rescue.

So the new machine brings its master to his home, in many cases to discover that he has but escaped the Charybdis of the traffic to encounter the rocky Scylla of domestic dissension. For it is from his non-cycling womenkind that the cyclist encounters the greatest opposition to his machine. The mind of woman is distinctly conservative, and is slow to accept innovations without prejudice. Especially is this the case when the innovation arrives in the questionable shape of a cycle whose wheels are not altogether innocent of mud. Moreover, notwithstanding the vast influences of the cycle aforementioned, it has not yet had time to leave its mark in the domestic architecture of the nineteenth century, to the extent of the provision of a room or building suitable for its reception and conservation. Self-respecting cyclists are wont to keep their machines in the entrance hall of their residences, or in some room or closet pertaining thereto. Some enthusiasts go so far as to keep their beloved mount in their drawing-rooms and boudoirs, decorating it with Liberty fabrics and artificial flowers. This is pure madness, since, to attempt to make a cosy corner out of a bicycle and two egg-boxes, is to proclaim

Evening at the Chalet du Cycle.
(Drawn by J. Greig.)

one's self as insane as the man who tried to call a smile to the face of a melancholy rhinoceros by tickling it with a feather. It is to make a fool of an otherwise sensible—or in the latter case insensible—invention.

The unsophisticated mind of the non-cycling housekeeper is ofttimes incapable of appreciating the delicacy of the mechanism by which the modern cycle is propelled. To her ideas, a coal-shed or a damp, leaky outhouse were all too luxurious a shelter for a machine destined to work amidst the muddy surroundings of the public highways. That it should be deposited upon the immaculate carpet and beeswaxed linoleum of the hall savours too much of high treason against the domestic deities. Hence the friction that often arises in households into which the cycle is introduced for the first time.

Domestic law, too, has not yet been modified to meet the requirements of the cycling household. The housemaid is wont to protest that it is not "her place" to clean up the dust and general disarrangement made by the cycle. It is not yet recognized as a piece of domestic furniture by the canons of the unwritten law that controls every well-regulated employer of domestic labour. Therefore to request a house-servant to clean a bicycle is tantamount to promoting a strike on the part of the whole establishment. Even a stable-boy must be delicately handled before he will have anything to do with an object obviously aimed at the destruction of his regular employment. So the cyclist must perforce clean his new machine himself.

He makes a virtue of necessity, gilt-edging it with many good resolutions—of which, by the way, the cycle is a prolific promoter. "If you want a thing done well," he remembers, "you must do it yourself." The plating shall always shine with the brilliancy of burnished silver, and the enamel shall be as immaculate in its glossy darkness as the chief mourner at a nigger funeral. He keeps his vow for about two mornings, polishing and leathering away with commendable energy. But on the third morning the novelty wears off the enthralling pursuit. He finds that stooping over the machine causes his back to ache, whilst his unaccustomed fingers get jammed and twisted in the revolving spokes of the wheels.

The problem of learning to ride now confronts him. Disdaining the exotic atmosphere of the riding school, he calls in the aid of some disinterested acquaintance, who, in blissful ignorance of the trial to which he is submitting himself, consents to act as a "second" in the proposed duel. Together, under the cover of night, they steal forth guiltily, their destination being some quiet back road previously agreed upon as a suitable riding ground.

Leading the machine with caution born of his previous painful experiences of that operation, the tyro, accompanied by his friend, arrives at the site selected for the first essay. They find that their "quiet, secluded spot" has suggested itself to others bent on the same purpose, for the road is alive with the wobbling lights of learners in all stages of cycling instability.

Undaunted by the lack of privacy, our friend elects to commence operations at once. His companion, as ignorant as himself of the treacherous nature of the unbacked cycle, grasps the handle-bar with that same innocent, trusting confidence wherewith old, but inexperienced, bachelors are wont to receive new babies for near inspection. The would-be rider struggles to the saddle, digging his heels firmly into the pedals, and grasping the handle-bars with the tenacity of despair. The machine jibs and backs, to the undisguised horror of the faithful friend, who clings wildly to the handle-bar as he announces the obvious fact that "she's going over." "She" goes over with a resounding crash, that flutters half the wobbling learners on the road into following "her" example. The novice, who has yet to learn the primary art of falling on his feet, falls on his back instead.

In the due course of time and of many falls, he learns to maintain a wavering and eccentric course without the assistance of his friend. Then comes the ordeal of learning to mount and dismount. He learns to dismount first, since that is an automatic process assisted largely by the laws of gravitation. To mount is another affair altogether, requiring much artificial assistance from lamp-posts, kerb stones, letter-boxes, and the like.

At this point of his career he finds that his cycle has developed a wondrous and fearsome susceptibility to mysterious outside influences. All objects on or near his path, animate and otherwise, seem to become endowed with a subtle yet irresistible magnetic attraction for his yet uncertain steering-wheel. Fire-alarms, policemen, trees, dogs, perambulators, and butchers' carts—in fact, every common object of the wayside—duly exert their influence on his steed of steel. For a lengthy period he finds that the only method of avoiding an antagonist of unusual size, such as a tramcar or a traction-engine, is to throw himself from the saddle on its first appearance, however far away, and wait patiently until it has disappeared behind him.

Having at length overcome this weakness, he feels that he has now become an accomplished cyclist, and essays feats of skill and daring on greasy and traffic-laden roads, that cause the flesh of more experienced cyclists to creep with horror.

He will drive his twenty-inch handle-bar through a twenty-eight inch opening in the traffic stream, with the utmost *sang-froid*, thus allowing four inches on either side between himself and the serious accident that sometimes overtakes him. Ladies are terrible offenders in this respect. I remember an accident that occurred in Battersea

Park, which was fortunately of a more humourous than dangerous nature. A lady, evidently a beginner, was following a water-cart not in action. Suddenly the man pressed the lever. The lady, terrified, attempted to turn aside, but only succeeded in falling right under the gushing spray. Now, if nothing further had occurred, her damp misery would have been of but short duration; but an eager gentleman shouted wildly at the driver, who, thinking something wrong, pulled up and looked round. Of course he could see nothing from his perch, and while he was engaged in a war of words with the gentleman who was running up, the lady remained in the centre of a cold shower-bath entangled in her machine. She will not forget that ride in a hurry.

Should our friend, as is somewhat improbable, survive this trying period of cycling adolescence, he will probably become interested in the development of speed awheel. To this end he radically alters the construction of the machine, that hitherto has appeared to his partial eye all that the most perfect of cycles should be. Or perchance he invests in a new machine altogether. His development of that mysterious quality known in cycling parlance as "speed" is marked by an increasing curvature to his spine and diameter to his gear wheel. He may, indeed, develop into that terrible creature the "scorcher," who, absolutely unmindful of the beauties of the scenery through which he passes, neglects, in his one idea of pace, the clothes and the customs of a respectable individual. His saddle will rise with his "speed," whilst his handle-bar droops and becomes narrower, till it would seem to disappear altogether in the grasp of his hand, splayed by much vibration and jolting of the roadway. He will affect strange garments, sad as to colour, and roomy in cut, whilst his shoes must be stamped from one piece of leather to meet his depraved taste for simplicity and lightness. His only adornments will be his club badge and the silk handkerchief, in which are embodied his club colours, which he wraps loosely round his neck, leaving the ends to flutter pennon-like in the breeze, as he urges his wild career, on space-devouring thoughts intent. He will cultivate a large circle of acquaintances, whose only visible occupation consists in the riding of multicycles and the acquisition of staying powers.

Yet if our friend whose trials we have watched will but use his wheel aright it will lead him into the pleasant paths of cycling life. As a tourist, he will become acquainted with the joys and sorrows of the road. Many are the strange happenings that lighten the paths of the tourist, and many and wonderful are the stories told by him, when he returns, tanned and bronzed, from his wanderings awheel. Fearsome stories are his—of tyres that punctured in the dead of the night, far away from the confines of civilization; of strange and unaccustomed garments borrowed from hospitable landlords of wayside inns, when his own have been drying before the kitchen fire; of wakeful nights in the haunted guest chambers of ancient hostelries; and last, but not least, of strange collisions with the manifold objects that lie in wait to trap the unwary wheelman.

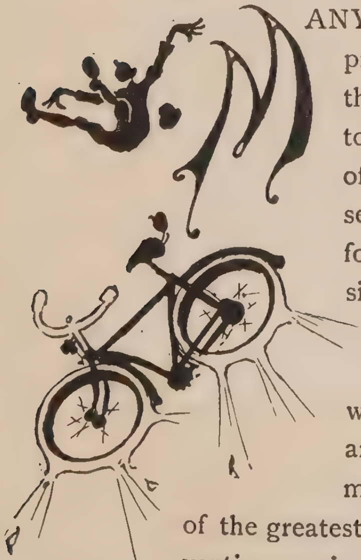
In this connection a strange story is told by a well-known tourist, whose personal character is sufficient guarantee for its veracity. It appears that whilst he was riding one day through a small hamlet, a duck fluttered up from beneath his wheel, to fall apparently dead by the roadside. Its indignant owner, rushing out from a wayside cottage, stopped the cyclist, and gave him no peace until he had paid the estimated value of the duck's life. The cyclist, having settled the affair to the satisfaction of the bereaved duck fancier, rode on his way, giving no further thought to the matter, till, some time after, again having occasion to pass the same spot, he was surprised when the accident again occurred in precisely the same manner, the second victim of his carelessness bearing a strange family likeness to the duck that he had previously killed. Again the owner rushed forth and mulcted him in damages. His suspicions being aroused by this coincidence—almost as strange as that experienced by the elder Mr. Weller on the occasion of his conveying voters to the poll and upsetting them into the river—he stealthily concealed himself behind an adjacent hedge, which commanded a view of the scene of slaughter. Presently he saw what might have been the ghost of his victim stroll casually across the road. At the same time he heard the warning tinkle of a cyclist's bell sounding in the distance. This was shortly afterwards followed by the appearance of an unsuspecting rider. Beneath his wheel the duck fluttered for a moment, and then lay stiff and stark by the side of the road. As the irate owner again rushed forth to claim damages, his intention was at once baulked by the lurking tourist, who, stepping forth from his hiding-place, and, picking up the yet warm body of the duck, puffed a volume of tobacco-smoke into its nostrils, a restorative treatment that was immediately followed by an indignant and very lively struggle on the part of the ingenious bird. Inquiries subsequently made in the neighbourhood revealed the fact that the duck itself had been the originator of the trick, which the owner observing, and enhancing the effect by a little training, had been made the means of an extensive system of roadside piracy and blackmailing. In fact, as far as the *raconteur* of this interesting anecdote is aware, the duck is still pursuing its nefarious avocation to this day.

Perhaps the only novelist that has treated the touring cyclist with real humour is Mr. Wells, in "The Wheels of Chance." His analysis of the feelings of a rider on his first long expedition is ludicrously accurate. We have now several narratives written by men who have cycled over country which, to the average Englishman, would have been deemed inaccessible to the wheel. All have heard how the cyclist with ammunition outpaced the Matabele warriors in the recent war. Under such circumstances a punctured tyre would have furnished a tragic rather than a humourous conclusion to his ride. It was, again, a cyclist from Johannesburg that brought to Dr. Jim the much-disputed cypher concealed in his saddle tube. Mr. Jefferson, in his famous tour through Siberia, relates how he met, near Smolensk, a rough-looking Russian peasant, who, sturdy beggar that he was, demanded food and drink. Samaritan-like, the traveller, with some hesitation, profferred to the humble subject of the Czar his last remaining flask of "White's Electrine." But he need not have felt alarmed as to how his gift would be received. With evident relish, the peasant drained the oil to the dregs, and departed with the joyous air of he who cries, "Fate cannot touch me, I have dined to-day."

We all know and dread the "traveller's tale," but it has been recently affirmed that an ardent Japanese Buddhist has discovered a new use for the cycle. As is generally known, the prayer-wheel is a leading feature in his religious system. A man, it is held, has prayed a prayer on each revolution of the wheel to which the prayer is attached. Now the 'cute Buddhist attaches his prayer to the rim of the wheel and drives along, a present instance of the old motto "*Laborare est orare.*" The Yank is not to be beaten by the Buddhist, and, as report hath it, American manufacturers are already at work on machines for the Japanese market, with tyres covered with embossed prayers in Japanese characters. This has the double advantage of providing a means of religious exercise, and preventing the tyre from slipping. Whether this will lead to "scorching" on Buddhist roads is, of course, an open question; but it is quite possible. The fast young man who goes the pace will, in contradistinction to Europe, be considered an ornament to his family circle.

CHAPTER VII.

ON PNEUMATIC TYRES AND THE METHODS OF REPAIRING THEM.



MANY riders look upon pneumatic tyres and the troubles incidental to their use as a sort of plague, specially sent to punish them for their transgressions. Worrying as are punctures and the other evils which all inflated tyres are heir to, the pneumatic principle is one of the greatest boons which the inventive genius of man has ever contrived for the benefit of the cyclist. How it alleviates the discomforts of road travelling only those who graduated on the solid tyre of days gone by can tell. No solid or cushion tyre of any other variety can be for a moment compared with it. Every year attempts are made by inventors to improve the air tyre by non-puncturing devices of many and various natures, from sheet steel bands to "alligator treads." Indeed, most substances, either with or without any claims to suitability, have at various periods been pressed into service. Many inventors have gone so far as to attempt to improve the pneumatic altogether "off the face of the earth" by substituting springs either in the frame, the spokes, or in some cases in the tyre itself. Most of these attempts, both as regards the non-puncturing devices and the substitutes for the pneumatic principle, have originated from non-riders, and from those with little experience, who imagine that a puncture is a dreadful sort of accident, entailing a visit to the repairers, and perhaps a long tramp with a disabled machine. On the other hand, to the experienced rider with a "midget outfit" in his vest pocket, it simply means a few minutes' delay. I have often stayed to repair a puncture when only a few hundred yards from home, sooner than walk the distance.

Owing to the sweeping action of the patent rights held by the great Dunlop company, the market has been to some extent cleared of the many different makes of tyres; Darwin's law of the survival of the fittest has held good. There has been more fierce competition, envy, hatred, and malice in the tyre trade than has ever been displayed in other branches of the cycle business. Records are fought for and every rider in the professional ranks (as well as many so-called amateurs) is probably subsidized by one or other of the companies to ride on their tyres. If a tip-top man, he gets a heavy cash payment; if only a coming man or third-rater, his tyres are given free and a promise of remuneration made when he accomplishes a good performance. There is probably very little to choose between the best tyres of the leading makers as regards speed. Thus records should have but small influence in inducing a selection by an ordinary rider. He should choose the tyre he most fancies, one by preference in which he has had previous experience. He will thus be familiar with the means of detaching and replacing the cover.

Dunlop tyres.

The form of tyre most used in this country is that known as the "wired-on" variety, of which the best example is the Dunlop. Of all the tyres in use here, probably nine out of ten would be Dunlops. The company was the first to place the pneumatic tyre on the market. Although in its early days it seemed probable that other tyres, superior to the Dunlop as regards ease of detachment, would compete with it closely, its makers, by clever management, and by always supplying the very best materials which money could buy, have attained a position which practically gives them a monopoly. Their patents now cover every variety of tyre, excepting those known as "hose pipe" or "single tube," and the Macintosh patterns, of which Messrs. Morgan and Wright are now the sole manufacturers.

The Dunlop, then, holds the post of honour. It is impossible to get a better tyre than one supplied by this firm. It is, however, closely run and nearly equalled by others which are to be procured at less cost. In due course I shall give a short description of each of the better-known types. Some of them may be preferred by those whose pockets are none too well lined and to whom the advantage of a pound in price is a great consideration.

The Dunlop tyre, as most riders probably know, consists of an outer cover of a peculiarly woven fabric, covered again with indiarubber of the purest and best quality. The edges of this cover are secured to two endless wires, which are exactly the same size as the rim at a point about half-way between its lips and the bottom of the centre grove. Both the rims and the wires are made with an extreme amount of accuracy, an error of one-sixteenth of an inch in the circumference being sufficient to disqualify them. The principle which governs the cover is shortly this. When one side of the wire loop is depressed into the lower portion of the rim, it allows the other to rise up and be forced over the edge of the rim. In actual use, the pressure of the air in the inner tube being the same all round, the tyre keeps the wire securely lodged on the shallow ridges in the rim. To remove the cover all that the rider has to do is to deflate the tyre by unscrewing the screw cap on the valve and withdrawing the plug, which is covered with a small rubber tube. In an instant the air will rush out. Then by a circular motion of both thumbs, commencing at a point opposite the valve, the wired edges can be depressed to the bottom of the rim and a small lever inserted under the wire just above the valve—which should have had the small running nut taken away to allow the stem remaining in the inner tube to be lifted clear of the rim. The operator must take care in using the lever not to get hold of a bit of the inner tube as well; if he does he will have to pay the penalty in the shape of a large rent to mend.

Many riders do not seem to grasp the method of taking off a cover of this kind. Once the knack is learnt it is as easy as any other mechanical operation. All that has to be borne in mind is, that to allow enough slack to be raised over the rim, a corresponding depression must take place at the opposite side. This can only be attained by seeing that the edge of the cover goes right down to the very bottom of the groove, which it will not do unless the way is clear and no small patches of air tube are nipped under it. It is only necessary to remove one side of the cover, for then the air tube can be easily got out for inspection.

Locating a puncture.

A puncture, if small, cannot be found by mere searching unless the rider has marked the spot and knows where to find it. The usual method is to inflate the tube until it is about the same size as when in the cover and then to immerse it, a bit at a time, in a vessel of water. The orifice will be discovered by a small stream of bubbles rising through the fluid. The place should be then marked in any suitable way, an analine pencil being the best, and a small piece of rubber called a patch put on. The rider must be careful not to over-inflate the tube, or it will suddenly assume the shape of a large bladder in one portion. When this happens, the pressure must be instantly relieved by loosening the plug, and a little pressure put upon the distended part to make it resume its original shape. Often it is very difficult to find very minute punctures, as they only leak at the high pressure obtainable in the cover, and close themselves automatically at those which are permissible when the tube is without the extra assistance afforded by the outer cover. A good method of finding such leaks is to stretch the tube a bit at a time when under the water, which will often open the orifice and disclose the leak.

Many tubes leak around the valves. This fault can be discovered in a similar fashion to that described above, by bending the valve to each side alternately while the tube is submerged. The joint gives trouble sometimes, but when it is suspected, stretching the tube tends to close the opening, so that some other method must be made use of. Movements in many directions are the best, the tube at this spot being worked about until a small bubble is seen to creep out.

Repairing a puncture.

Having found the leak, making it good is easy. Scrape the place well with a bit of coarse emery or glass paper until all the white powder has been removed from the rubber. This is really French chalk, and is put on the tube to prevent it sticking to the mould during manufacture. Unless this is properly removed the patch will not stick. When the tube is clean a little rubber solution has to be rubbed on with the tip of the finger and a suitable patch of rubber selected and treated in the same manner. Sufficient time must be given to allow the solution to become dry, or, as it is technically known, "tacky." The patch will not hold to the tube if put on before this stage is reached. Then the rider carefully presses down the patch, and to prevent the excess of solution taking hold of the outer cover, dusts a little French chalk over the newly-made repair. The cover is replaced in a similar manner to that in which it was detached. The rider replaces the tube and valve, and after tucking in the tube under the cover, which it is presumed has one wire already in the rim in its usual position, he inflates the tube to a very small extent—just a few puffs of air sufficient to prevent the loose folds of the empty tube getting nipped under the wired edge of the cover. He then begins at a spot about opposite the valve, and tucks the wired edge of the cover down into the rim, bringing the cover over the rim for as great a distance as he can. When all excepting a few inches of the cover has been fixed in it will be found to go very hard. Then, by opening the valve, he must let out the air in the tube and afterwards run his thumb round the cover in both directions, making sure that it rests in the bottom of the groove. As soon as he finds this to be the case, a little determined pressure, applied by the fingers only, will soon work the remainder over the edge of the rim. When at last the cover has resumed its correct position at the side of the valve, the loose nut on the valve stem can be tightened down, and the tyre fully inflated. Bad punctures will require, in addition to repairs to the air tube, a patch of canvas inserted on the inner side of the cover. This is accomplished in exactly the same manner as in fixing a rubber patch on an air tube. A good coating of solution is applied to the canvas and another to the inner side of the cover, which, if time allows, should be repeated when the first coat is dry; then the canvas patch is put in position, and a little French chalk applied. Sometimes a very fair repair can be made of a cut in the outer rubber covering, if it is taken in time before too much grit has worked in. The edges of the cut must be well cleaned and coated with solution. Then when quite dry they must be pressed together and a small patch of canvas applied to hold them in that position until quite set.

Repairing a joint.

A leaky joint in an air tube wants some little skill to remake nicely. First, the joint has to be unfastened, a process which is best accomplished by loosening the solution with benzoline, applied with a small camel's-hair pencil. This spirit evaporates so quickly, that the rider must be ready to get a portion of the joint undone almost as soon as the spirit is applied. If he can get any help to stretch one portion of the rubber while he himself applies the spirit, it will facilitate matters. When all is laid bare and the tube is in one long piece, the two ends must be very carefully cleaned—one on the outside, and the other on the in. This can be accomplished by turning back a portion of one for some two inches or a little less, until, like a partially-skinned eel, what was inside is now out. When both have been properly cleaned, a good coating of solution is applied for some inch or so at each end. When this is dry, the two ends are pressed together, the plain end going just inside the termination of the one which is still doubled back on itself. When the commencement of the joint is fairly made without wrinkles or other faults, which would certainly lead to leaking, a portion is deftly unrolled from the overlap; then another coating of solution is given to the remainder, and, when dry, it is in its turn unrolled over the other, completing the joint. The object of not applying solution to the whole joint at once is to allow the operator to do a little manœuvring in getting it into position. It is much easier to make the joint in this manner than to attempt the whole at once, as a well-skilled expert would be more likely to do.

Repairing a valve.

Should a valve leak, it will be generally in one of two places—either around the seating or where the rubber plug goes into the stem. The latter is easily made good by simply inserting a new rubber tubing, which is to be found in all repair outfits, and can be put on by wetting the valve spindle and forcing it into place with the fingers. Should the leak be around the stem, where it goes into the air tube, the small fly-nut which makes the joint here must be undone, and the little canvas patch taken off by the aid of our friend benzoline again. When this has been done, the valve can be pulled out of the tube and its flange cleaned. Meantime a patch of rubber with a hole in its centre of the same size, or a trifle smaller than that in the air tube, is taken, and fixed on with solution over the place where the valve will be. Care must be taken that the hole in the patch and that in the air tube coincide. The valve is then slipped back into position, and the canvas again fixed with solution over all. Lastly, the fly-nut and washer must be screwed down tightly, so as to make a good joint.

The Fleuss.

The foregoing processes of repair are applicable to all and every detachable pneumatic tyre, with certain exceptions which require different treatment. Of these, one is the Fleuss tyre, the patch being placed inside the cover, there being no air tube. This tyre may be the herald of a revolution in pneumatics; it is only just on the market, and its capabilities have to be proved. It is certainly startling as regards ingenuity. When it was first brought to my notice —about May, 1896—I was extremely doubtful if it could ever be made to answer the requirements of practical hard wear in the hands of ordinary riders. When one considers that it has a joint, which requires to be perfectly air-tight, extending the whole length of the inner circumference of the tyre, and that this joint depends upon the pressure of the confined air on a loose rubber flap, it is marvellous that the tyre will hold air as it does. Yet, from the opinions and tests of unbiased riders, it appears to be superior in this respect to most double-tube tyres, and a small puncture can be repaired simply by rubbing a little solution over the locality of the leak from inside; while such extemporary means as postage stamps and even thorns have been used with success as patches and plugs. The tyre is detached with great ease, and replaced as readily. The method of construction is not unlike the Clincher, with an outer cover alone, and the flap added. I need not say that an action by the Dunlop company was promptly entered into against the makers of this new tyre for infringement of Bartlett's patents for the Clincher principle, the result of which is awaited with eagerness by all interested in cycle manufacture.

Single-tube tyres.

The single tube is another exception to the general rule for repairing pneumatic tyres. They vary greatly in quality, sometimes being composed of cheap and untrustworthy, and at other times of really excellent, material. The American hose-pipe tyre is an instance of the latter. The method of repairing leaks with this form of tyre is to first locate the puncture by immersing the whole tyre a bit at a time in water, and then to insert a plug of indiarubber dressed with solution. A set of special tools accompanies each pair of good tyres, which renders this easy. The solution is applied to the inside of the tyre by means of a small metallic syringe, and a plug of rubber well washed with solution forced into the hole. If the puncture is a bad one, a portion of the tyre is cut away with a special instrument, leaving a clean, round hole to take the plug. Hose-pipe tyres are much used in America; but in England they have not found favour, owing to riders finding difficulty in repairing them. The tyre eventually becomes porous, and the air from some badly repaired puncture, finding its way along the canvas, causes a number of apparent leaks from each small cut in the outer rubber. The best English example of single-tube tyres was the old "Palmer," which was probably the fastest tyre ever made.

Morgan and Wright tyre.

The Morgan and Wright, known as the "Good Tyre," and made on the principle invented by Macintosh, also requires different treatment to the ordinary detachable tyre. They have a special air tube, with a loose flap of very thin rubber inside it, enabling a puncture, which can be located, to be repaired without taking out the inner tube or removing the tyre from the rim. From practical experience, I can vouch for the efficiency of these tyres. The price is just half that charged for the best detachable tyre. They have the further advantage that they can be put on a very light wood rim without any fear of its bursting from air pressure. Probably on this account they are much favoured in the United States of America, where steel rims are now things of the past. The quick repair system answers perfectly whenever the puncture can be discovered; and this is the case with certainly nine out of ten ordinary punctures. The rider suddenly finds the tyre go down, and on examining the cover the instrument of destruction is found sticking in it. Even if it has been removed or fallen out, the puncture can often be found by trying the tyre in water, and from the place where the nail or thorn has entered the bubbles will be found to rise strongly. Having found the leak, the rider takes the small instrument supplied with the tyres, and proceeds to force its fine point into the hole until it enters the inner tube. Then the piston is unscrewed, and if all has been properly performed, the air will rush out with a strong hissing sound. To ensure the air tube being entered, it is advisable to pump up the tyre as hard as possible before commencing the repair. If the leak is too large for this to be done, the needle point can be pushed in with certainty. Then a charge of the special solution is poured into the instrument, and the wheel revolved until the puncture is at the lowest point. All that is now necessary is to screw down the piston, withdraw it, and press down the cover over the orifice. The solution is in this manner spread around the puncture, and enables the air tube to adhere to a portion of the loose flap. On inflating the tyre, the pressure of the air tends to drive the rubber flap closer to the tube and effectually closes the leak. Repairs done by this means are quite permanent, and the process is so simple that, once understood, it can be managed by any one without skill or exertion. The time lost need never exceed two minutes. I once rode thirteen miles at an easy pace, and repaired two punctures by this means, well within the hour, which shows that I could not have been a very long time over the repairs. The first was caused by a sharp piece of flint, and the second by a magnificent specimen of the common hob-nail. Both happened within a mile of each other.

Although these tyres are so cheap compared with the others, they are made of very fine material, and wear excellently. In case a puncture cannot be found, the air tube can be easily removed by unlacing the flap and withdrawing it,—a process accurately described in the well-illustrated pamphlet sent out by the company from their office in Coventry. Should this have to be done, the time consumed is, of course, much longer than in the case of one of the more readily detachable tyres ; indeed, it cannot be accomplished much under half an hour. But it is quite a simple matter ; it only requires careful observance of the directions. From experience I do not think these tyres quite equal in speed to Dunlops, the difference being slight, but at the same time appreciable. I think this must be due either to the fabric from which the lining of the covers are made or else to the fact that the air tube is a "butted" one, and consequently does not permit of a free circulation of the air through it, as in the case of a continuous tube. Taken all round, they are the best of the lower priced tyres, and to those whose means are limited the fact that they can get two of these tyres for the price of one is a consideration which will have weight.

Clincher, Palmer, and

The Clincher, Palmer, and Grappler tyres are a class by themselves, and are fixed to the rim by

Grappler tyre.

the pressure of inflation solely. The Clincher, as the first of this kind of tyre, may be taken as representative; the treatment suitable for it is applicable to the others. The rim is made with a hooked edge, into which a stiff ridge on the lower extremity of the cover enters. As the pressure of the air is equal all round, the tendency is to press the ridge tightly against the edge of the rim, thus effectually keeping the cover in position. A glance at a sectional view will readily explain the idea, which is not easily described on paper.

In case of a repair being necessary, a portion of the cover is withdrawn from under the rim, and a lever cautiously inserted under it, lifting it over the edge of the rim. Then a finger can be substituted for the lever, and by its means the whole of one side of the cover can be freed, and the air tube taken out in exactly the same manner as the Dunlop or other wired-on tyre. The method of repair is identical with that given previously for wired-on tyres. To replace the cover is easy. It is slipped on in the same manner as with a Dunlop, but the air tube does not require inflating until after the cover is in its place. Then a little air is pumped in, and the operator carefully examines the interior of the rim, a bit at a time, by pushing the edge of the cover from under the overhanging lip of the rim so as to make sure that no portion of the air tube is nipped. If he finds that such is the case he must knead and work the cover about until it is free. To leave ever so small a portion of the air tube in this position may cause the outer cover to burst off. I well remember a lady examining a machine just finished at the makers, fitted with Clinchers. While she was in admiration passing her hands over the beautifully finished enamelling, the front tyre suddenly exploded with a report like a heavily loaded gun. Her consternation can be more easily imagined than described. It is hardly necessary to say that she did not buy a machine—at least on that occasion.

The Grappler differs only from the Clincher and Palmer tyre in having small metal hooks which do duty for the ridge in the two former. This method is, in my estimation, a more certain form of attachment than the other, and there is less fear of such a catastrophe as I have mentioned.

Unpuncturable air tubes.

With a view to minimizing punctures, revivals of the early attempts in this direction by Macintosh have been put on the market, and several companies exist who supply air tubes which are supposed to be self closing. From what I hear they answer their purpose fairly well. However, the tube is heavier than the plain air tube, and, in my idea, must tend to slow a tyre. The self-closing apparatus is only on the top of the tube, and affords no protection against those perforations which often occur on the sides and lower portions; so that even supposing they answer as well as the vendors claim, a certain proportion of repairs will have to be made. They are only in use to a limited extent, and do not appear to be making headway. The principle on which they work is simple. Advantage is taken of the self-closing properties of rubber under compression. An air tube is made as usual in a straight length, and stretched on a rod or mandrel. While elongated in this position it is covered with solution, and another piece of rubber, which is not stretched at all, cemented to it. When the two are securely fastened together, the tube is removed from the mandrel, and the greater power exerted by the air tube itself compresses the added strip until the length of the tube is but little longer than it was at first. The tube is completed by the addition of a small strip of linen to prevent the further action of the two surfaces under tension. From the small amount I know of the actual details of this process it seems to me almost identical with the old plan tried by Macintosh in the early days of pneumatic tyres; and although his plan answered perfectly, as I can vouch for from personal experience, it was abandoned, because riders found that the addition slowed the tyres.

Another puncture-resisting device is to insert a small belt of specially treated cotton fibre between the cover and the tube, which resists any attempt to force sharp instruments through it. Although this appliance has been on the market for a length of time, it has only made small progress, the bulk of the riders preferring the evil they know of to the cure with its real or fancied disadvantages.

Cushion and solid tyres.

Cushion and large solid tyres are now only to be found on cheap machines and those used solely for business purposes. They are, of course, much slower and less comfortable than pneumatics of any kind, and have only the non-puncturing quality to recommend them. The majority of so-called cushions are really solid tyres, for the makers have found out that unless the rubber is particularly suited to the purpose it splits, and the tyre becomes useless. The price at which some so-called cushion tyres are obtainable is so low, that if a comparison with the price of raw rubber is made, it will be seen that they must contain but very little of it. Indeed, I have been told that old rubber goods are ground down and a mixture made from which these tyres are constructed. They are certainly extremely heavy, and will sink in water like lead, whereas pure rubber is almost of the same specific gravity as water, and often floats. This used to be the test in the early days of solid tyres, when those necessary articles were made of much better rubber than their modern namesakes.

CHAPTER VIII.

HOW TO RIDE.

AMONG those who do not ride considerable misconception exists as to the difficulty of learning the art of balancing on a bicycle. They appear to think that it is a task akin to walking a tight rope, and that the rider is continually concentrating his attention upon keeping himself and his machine on an even keel. This is simply absurd, and when once the rudiments of the task have been acquired, a rider no longer thinks about it ; no more, in fact, than does a pedestrian, who, unknown to himself, is constantly adjusting his balance in a manner similar to an expert cyclist. It is done unconsciously in each case, and if any one doubts the latter fact, let him try the experiment of standing upon a limited base at some height from the ground, when he will soon realize that he does not stand still without a constant involuntary effort on the part of the muscles to enable a balance to be maintained. Much nonsense has been talked by medical men of the "constant mental strain of balance" to which a cyclist is subjected. However this may be for learners, for regular riders such a strain is non-existent. It is much easier to propel a cycle at some speed than very slowly, for the reason that when progressing fast the wheels tend to keep themselves upright from centrifugal force, in the same manner as a top spins or a hoop keeps itself erect when bowled along. A slight movement applied by the rider to the handle bar answers much quicker at speed. This, again, contributes to a straight course and an easy balance. It is only after the rider has attained proficiency that he can master the more difficult task of going at a very slow pace.

What each learner must remember is simply to turn the handles in the direction in which he is falling. Having drummed this into his head, the rest is easy. He will soon discover that there is a happy medium and that the bars require only to be turned slightly, and instantly brought back to the straight so soon as the machine has resumed the perpendicular. Many do anything but remember this rule, and consequently make bad pupils. Some only require a very short time before they are able to ride alone. After a couple of lessons, say, of half an hour each, any average person should be able to ride for short distances. I once taught a friend, who could not be described as athletic, as he was well on towards middle age, and had never attempted cycling before, in the remarkably short time of twenty minutes, and this was on the old Ordinary. Next day he could mount and dismount, and disdained further help. He simply carefully remembered the rule I have mentioned and put it into practice. Having plenty of confidence, he did not throw up his hands and come down every time the machine leaned on one side. He simply persevered until he found out by experience how not to overdo the turning process. This was before the days of cycling for ladies, and I well remember that his wife never forgave me for my tuition. Her husband had been before a model man, who had always taken his family for regular constitutionals. When he became an ardent cyclist he preferred his wheel to his previous domestic enjoyments. His wife did not forget to remind him of the fact that a bicycle was not a thing for a respectable married man with a family. At the present day, however, the cycle no longer need divide the domestic circle.

Every one naturally requires a little assistance to properly acquire the knack of balancing a machine; that is to say, if he wishes to become a rider with the minimum of inconvenience. It is possible with a Safety to dispense with this aid, but not advisable. The process when no assistance is forthcoming is to obtain a low-built machine, and put down the saddle until the rider can easily reach the ground with both toes. He can then, on a gentle incline, allow the machine to progress of its own accord, helping it occasionally, *à la* hobby-horse, until he has mastered the difficulty of keeping it upright. The best method is to obtain the aid of a friend to hold up the machine until he is sufficiently accomplished to go alone. Even after that a little assistance from one who can ride is of great value, and many falls will be avoided by his timely help. Otherwise visits to the repairer or nearest blacksmith to straighten bent cranks and pedals will be of common occurrence.

It is never advisable to learn on a good machine. The cheapest and most convenient way is to go to one of the regular schools for the purpose, which now exist in most towns of any importance. The average cost for a series of lessons is about half a guinea, and the rider will save this amount in repairers' bills. Many agents teach customers for new machines free. However, the purchaser should see that the instruction is not given in lieu of the proper discount he should get for ready cash—often 10 to 20 per cent. according to the class of mount he buys. If he is charged the full list price he will have paid far too dearly for his tuition. While on this subject I may mention that discounts are the bane of the trade, many cheap machines being listed at double their value, and the buyer tempted

IN HYDE PARK.

into purchasing by being offered them at what appears a ridiculous sacrifice. The cycle trade is verging towards the state said to exist in the nail trade a few years ago, when discounts ranged up to 95 per cent., with an extra two and a half off for cash. It will be a good thing for every one connected with cycling when a system of nett cash prices is adopted.

As soon as the rider can balance himself—or herself, as the case may be—frequent practice in mounting and dismounting must be indulged in until the feat can be easily accomplished under any circumstances. The beginner should not venture into frequented thoroughfares until complete mastery of the machine is attained. If he does he will be tempting providence, and not only will be risking his own life and limb, but causing inconvenience and danger to other cyclists. The plan adopted by the local authorities in some continental cities, of making learners pass an examination in proficiency, is an excellent one. It would be a good thing if the same regulations were in force in England. It would prevent many ambitious learners heedlessly running into peril, and would quiet the tongues of many who talk loudly of the dangers of cycling. Every cyclist of experience knows what it means to meet a learner; he is looked upon in the same light as a mad dog or a demented bull, and a wide berth given him. Unfortunately, the sight of ladies, who ought to be still in the riding school, careering along crowded streets is far too common. Those who appreciate their danger give many an involuntary shudder as they reel about among heavy vehicles perfectly unconscious of what the effect of a side slip must be.

The method of mounting for gentlemen, when the step is used, is to place one foot upon it and take a few hops with the other, until the machine has gained sufficient impetus to enable it to be kept upright while the rider raises himself into the saddle and catches the pedals. This is the oldest method of mounting, and the easiest when tired. It is going out of fashion now, on account of modern light machines being often made without steps. In the latter case the rider strides the machine with one foot on the ground, or, if it is high for him, on a bank or curb, and pushes off with this foot, while with the other he makes a strong stroke with the pedal. The ladies' mount is similar to this, excepting that, owing to their having as a rule a shorter reach than men, it is requisite that the mount be made more from the pedal. The rider gets into position with one foot on the pedal, which should be placed at about one-third of its stroke on the downward grade. Then with a spring from the other foot, aided by pressure applied to the descending pedal, she starts the machine.

Dismounting is easy. Men simply use the left pedal as a fulcrum, and, by swinging the right leg over the back wheel, step easily to the ground. Many riders simply step out behind, placing the whole weight on either convenient pedal. Even the step can be used in dismounting, the rider feeling for it and using it in the reverse manner to that employed for mounting. Ladies dismount in a different manner. Owing to the open frame, it is possible to bring either foot over on the same side as the other. It is then quite easy to step off on to the ground without any effort. Beginners should remember to choose the time when the pedal is ascending; and by placing their weight on it as they alight, they will check the remaining velocity of the machine, so that a dead stop is made. If attempted by a learner at too great a pace, the result is likely to be a fall, as the position of the feet is not adapted for a sudden check.

Having learned to ride, the beginner must carefully adjust his machine to his requirements. I have presumed that, to allow of greater facility for learning, he has commenced with a low saddle. This is a great disadvantage when proficiency has been attained. He must then get into the habit of mounting and riding with a machine suited to his reach and requirements in every respect. The handles should be, on an average, about the same height as the saddle, varying, of course, according to the length of the rider's arms. If too low, they will induce an attitude usually assumed by so-called "scorchers." This position is not only most unsightly, but confers no advantage on the rider, except for a very short sprint. It is quite unsuited for road riding for pleasure. It thus behoves the buyer of a new machine to be careful that enough stalk is attached to the handle bar to allow him to raise the handles to suit him when sitting in a proper upright position. He should make sure of this when buying a new machine. It is by no means advisable to trust entirely to the salesman's word on this question. The salesman may no doubt be acting honestly, but he may be mistaken.

The position of the saddle is one upon which a great deal depends. Fortunately that absurd idea of sitting about half a yard behind the work is now exploded. If anything, makers are overdoing the forward position. Ideas, of course, will vary with the requirements of each individual, and what may suit one rider will be fatal to the comfort of another. My position has not varied to any great extent since I gave up the Ordinary. I may have come forward an inch or so, but I have always endeavoured to continue to ride in the same position I found to suit me in my early days. I have had the satisfaction of seeing my ideas confirmed during the last two years by those who scoffed when I was not content with the extreme backward position of a few years ago. The peak of the saddle should, in my opinion, be some two or three inches behind the centre of the crank-axle. But riders will soon find out for themselves by experiment what position is the best suited to their requirements. When this is discovered, it is not advisable to attempt a change.

The height of the saddle depends, of course, upon the rider's reach. It should be set to such a height that he can, when sitting comfortably in the saddle, just reach the pedal with the centre of the foot or heel, the pedal being at the time at its lowest point. This is an old rule, and a good one. Riders will in some cases find a reach a trifle shorter suit them better, and others, again, may prefer to increase the reach; but these are points only to be discovered by experience, and the expert rider will be a better judge of what suits him than any other person.

The position and style to be aimed at are of importance in the development of a good rider. Once let a slovenly and bad action be acquired at the start, and the rider will find that, like all bad habits, it is difficult to unlearn. Form should be aimed at from the beginning. It is the same in all sports. Given a correct action and good style, and the weaker man will beat the stronger. This is simply because the neater rider does not waste his strength. His arms, legs, and body all act in union, and, pulling together, combine to make up for what he lacks in power.

One of the first points to be considered is the acquisition of the art of riding straight without visible effort. Try and follow, if possible, any straight rut left by a cart in the road, and always endeavour to make as near a bee-line as possible. Take the corners on an even curve. Do not make several lurches, and finally get round by describing half a dozen different chords of a circle, during which the machine has assumed quite a variety of angles with the ground. Lean inside to what you find is the proper angle for the turn at the pace you are going, then continue on a true sweep until round, and bring the machine upright again without any visible effort, for this will probably result in your leaning to the opposite side so far, that a swerve will be necessary to right the machine. Riders who cannot ride straight do much harm to their machines, and often suffer from a plague of punctures. These are caused by the fact that, being always on the twist, they help any sharp substance to penetrate the tyre, in the same manner that a bradawl works in much easier when turned than when merely pushed.

A correct pedalling action will prevent much waste of power, and the rider should endeavour to make good use of his ankles. I do not altogether agree with those authorities who have advocated ankle action to its fullest extent, though this may be a personal failing on my part. A certain amount of ankle action is excellent, but I think it can be carried to extremes. My own practice is to make about one quarter of the stroke, as near as I can judge, by ankle action alone, and the remainder with the leg; in other words, I pedal about a couple of inches at both the top and bottom of the stroke with the ankles, and the remainder with the power of the thigh muscles. The fullest pressure should be put on just before the pedal is at the quarter turn; then the force is applied, not in a perpendicular direction to the ground, but in the direction of the natural thrust, which will be some inches to the rear of a true vertical line. This pressure should be abated as the pedal gets below the centre until, when near its lowest point, any further action is more of a clawing nature, tending to draw it to the rear. For ordinary travelling, when but little power is wanted to propel the machine, a mere push just at the point of the greatest power is enough, and the pedal need merely be followed round for the rest of its course. On no account should the rider continue to push when the pedal is at its lowest, or he will be actually impeding the machine and working against himself. Many undoubtedly throw away power in this manner. By observing the chain much can be learned, for the object to be aimed at is even pedalling, which does not allow it to become slack on the top between the strokes. The arms only are wanted as aids to propulsion when extra exertion is required to propel a machine up a steep hill or against a head wind. On these occasions, by pulling at the handles a great increase of power can be obtained for a short distance; but, at the same time, continued pulling will soon exhaust the rider. A change of attitude is often a great relief. Say a long hill has to be negotiated; the rider begins by leaning slightly over, as if racing; then, as he feels the necessity for further help, he sits back and brings a fresh set of muscles into play. All movement of the body must be avoided; wagging the head or rolling the body from side to side not only looks very ugly, but does no good whatever.

To prevent discouragement, long distances should not be attempted until a considerable amount of regular riding has hardened the muscles. Cycling is like swimming. When used to the exercise, it becomes natural, and can be continued for long periods without undue fatigue; but the beginner is soon distressed. During the first season a ride of anything over fifty miles is usually more than should be attempted, although many young people, after only a few weeks as cyclists, think that they have only to mount and attempt long distances with the certainty of success. They are to be occasionally met with on all our well-known cycling highways. They start gaily, going strongly for the first few miles. Then they begin to feel the unusual strain; their muscles ache, and every little hill is a signal for them to dismount. Finally they give out, and in the last stages of exhaustion seek the nearest railway station. Many hundreds of such melancholy processions have I seen, wending their weary way up the hills leading over the South Downs. I remember a friend of mine who, though a good rider, was of very erratic disposition, and for a long time gave up cycling altogether. Then, for some reason, he suddenly altered his mind, and could not resist the temptation of an Easter tour with some old cycling friends. Hurriedly buying a new machine, he turned up for the start at six o'clock. It would almost seem better to draw a veil over his condition the next day ; but I may add that he was so fearfully done up that for the last twenty miles we had to tow him in turn. Of course, had he only practised a week or so he would have done treble the distance without an effort. To attempt to rival the performances of trained men is not only absurd but absolutely dangerous. When out of condition, it is exceedingly foolish for a rider to set himself any definite tasks. Many of the ill effects which doctors ascribe to ordinary cycling are due to similar foolish efforts. As a matter of fact, the same evil results would have been experienced by an untrained man who attempted any severe forms of exercise—as, for instance, mountaineering. Yet for this reason mountaineering would not be set down as disastrous to the constitution by the "faculty."

Hills require to be taken judiciously, and if at all steep, should be walked. It is only when the rider has got thoroughly seasoned that he can take everything as it comes and make reasonably certain of being able to ride his hundred miles comfortably, for several days in succession if necessary.

It is always on the second or third day that a man feels the effects of a long ride. According to Dr. E. B. Turner, an authority on the subject, the muscles become used up, and the degenerated tissue fills the blood with poison, which takes some time to work out of the system. This will account for the lassitude experienced on the succeeding days after a trying performance, and doubtless is the cause why men in strict training get "stale." I once, during my racing days, had a week, during which I won five races in succession, and finished up with a small country meeting in which the competitors were by no means brilliant. I was at scratch, and although I got through my men easily, I failed miserably, and had to give up in one of the races within fifty yards of the post. I was presented with a medal as big as a small dinner-plate for a longer contest, but only just won by most carefully nursing my strength and timing my effort. Had I been in my form of only a day or so before, I could have won by anything in reason. I could not then account for what had happened to me; I suppose I had simply exhausted my stock of vitality and not given my system time to recuperate.

Down grades want care in descending if the hill is not known to the rider, and it is never safe for him to put his feet up and coast a strange hill where the bottom cannot be seen. The rider must keep the machine in such control that he can pull up if an emergency arises. All and every kind of obstruction may appear in view when least expected. Herds of cattle may suddenly come meandering out of a field gate, a cumbersome farm waggon may block the road, or a couple of vehicles may be met which are just about to pass each other, leaving the cyclists no alternative but to pull up or be smashed up. A good brake is of the greatest use to a rider, and will allow him to coast a large percentage of these declines without having actual occasion to use it; but he knows that he is safe, for it is there if he should require it. The practice of riding down all hills with the feet up and the brake hard on is an expensive luxury, as the rider will discover by the amount he will find it necessary to expend in the renewal of his tyres.

Proper costume is essential for the rider's health and comfort. Now that cycling has become a popular amusement in society, it is a common sight to see ordinary clothes pressed into cycling service. This is all very well if only very gentle exercise is to be attempted; but for long rides white linen shirts with stiff collars and trousers with clips are most uncomfortable, and may lead to a chill which will cause serious illness. Many people may be seen riding in ordinary walking costume who would never dream of taking other forms of exercise without "changing." In the early days a regular uniform was worn by riders, which was sometimes ornamented in many and curious ways. This has now given place to a more sensible fashion, and so long as the garments are cut to allow of sufficient freedom to the limbs, and the inner linings are of flannel, any good tweed suiting may be worn. Knickerbockers and stockings should always be preferred to trousers, which do not look well, and if not secured in some fashion may, and do, catch in cotter pins and sometimes in the chain. It was my lot once, when boating on the Thames, to have to do a sprint to catch the train at Goring Station. I had borrowed an old crock from the hotel, without any gear-case or other protection, and on hearing the approach of the engine I put on a final burst. Suddenly

I became aware that the leg of my right trouser had been caught in the chain-wheel. I braced myself up, and, with a final effort, succeeded in tearing off all that portion which goes below the knee. I caught my train, but the remarks made by small boys as I wended my way home through town were anything but pleasant, and effectually cured me of any desire I might have had of using trousers for cycling purposes.

The under-garments should always be of wool, and the fine material sold by the Jaeger Company is the very best for the purpose. Cloths made from cotton, woven with internal cells, are advocated by some ; but, being well satisfied with the ordinary Jaeger flannel, I have not cared to risk making an experiment which might be followed with unpleasant consequences. Shoes for cycling require to be made of flexible leather, with stiff yet light soles. Horse skin is recommended, and used largely ; but, according to my experience, it cracks after much wear. Some riders appear to think that steel strips inside the sole are an improvement, and many, especially racing men, have bars of leather on the soles to engage in the rat-traps of the pedals. As the rider is not always upon his machine, and these appendages are far from pleasant to walk in, I cannot advise the ordinary rider to adopt them. If he finds any difficulty in keeping his feet from slipping, he can indulge in a pair of toe-clips. Many like them, and find their aid advantageous. I never have used them myself, and never suffered from pedal slipping even on the Ordinary, though I preferred rubber pedals for racing.

Riders will be able to follow their own tastes as regards hats and caps. The earliest in use, which was a sort of regulation head-gear for cycling, was a small polo cap. This has now been displaced by more sensible head coverings. Straw hats in summer do well, but are inconvenient in windy weather, and cause trouble when descending hills at speed. The ordinary cloth cap as used for shooting is difficult to improve upon, and most riders now wear it. A Scotch Tam-o'-Shanter is most serviceable for the vagaries of the English climate.

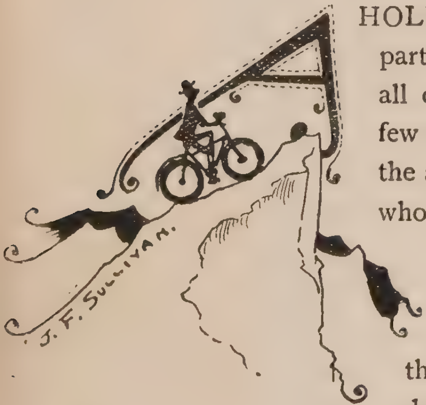
For wet weather, and as a protection against sudden showers, the rider may well carry a cape. This can be procured at any shop dealing in indiarubber goods. John Piggott, of Cheapside, sells a specially made cyclist's cape, made from extra thin rubber, which can be carried in the pocket. Those known as "Ponchos," made after the South American pattern, with a hole for the head, are not so convenient as others that open in the ordinary manner, but they are more successful in keeping out the wet. Rain insinuates itself between the button-holes of the ordinary cape, and drips down on the rider's legs. Choose one as long as possible. At the same time take care that it clears the rear wheel tyre. The longer it is, the more easily can it be draped round the handle-bar, and thus to some extent save the rider's knees. Riding in rainy weather is at all times a most unpleasant business, and a cape only partially alleviates the discomfort, the confined perspiration making the rider hot and clammy. Indeed, on this account, the extra ventilation caused by the open-fronted cape is an advantage. One important use to which the cape may be put, but for which it was not designed, is that of a shield for the rider's back when no mudguards are on the machine. I find that, in this respect, it serves excellently. A properly built machine does not throw up much mud above the level of the saddle at ordinary speeds, unless the ground is very sloppy. Under those circumstances, however, splashes must be expected, and a cape renders the rider quite independent of the rear mud-guard, while a strip of leather fixed to the bottom tube will protect him from the splashes caused by the front wheel.

Stockings give trouble by slipping down when the rider's calves are not particularly well developed, and some kind of suspender must be made use of. Garters are an abomination, and impede the circulation of the blood. Having never had any trouble in this respect, I find it difficult to suggest a cure. I have heard that pneumatic calves can be bought, which not only improve the appearance, but do away with the necessity for garters. I cannot say where these articles can be obtained, but would recommend an application to Messrs. Morgan and Wright, the tyre manufacturers, who have an amusing illustration in their catalogue of a lady who has unfortunately punctured one of these necessary adjuncts to perfect symmetry.

The "mere male" would be bold indeed who dared to enter on the question of the attire most suitable for lady cyclists. The chapter contributed by Mrs. Harcourt Williamson will contain hints upon this important subject.

CHAPTER IX.

ON TOURING AND THE TOURIST'S OUTFIT.


J. F. SULLIVAN.

A HOLIDAY on wheels is particularly attractive to all cyclists. There are few who have mastered the art of riding a cycle who will not at some time or the other undertake a short tour. When once they have tasted the delights of being perfectly independent of railways, of wandering at will over a wide expanse of beautiful country awaiting exploration, and last, but by no means least, of being able to obtain these varied enjoyments at highly economical rates, they will at last realize what a great future cycling has before it—a future which takes it out of the category of merely athletic sports, and raises it to a far higher level.

When a tour is contemplated, the rider should always secure companions, who, as he has already discovered, are likely to fall in with his ways. It is certain to lead to mutual dissatisfaction if care is not exercised in the choice of the men who are to be comrades for such a holiday. Young men will naturally select others of their own age, and the fast rider will be annoyed and disgusted if he finds himself tacked on to a slow coach, who cannot keep pace with him, and is always falling to the rear and dismounting at every hill. Although we are all willing to talk about the folly of "scorching," every one in his heart of hearts really enjoys an occasional trial of strength; and it is by such amicable, though hard-fought struggles, aroused by the vitality of youth and the English blood in our veins, that our nation has established itself as the athletic master of the world. During my time I have indulged in short road races with many a stranger, from the curate in a full clerical attire to the navvy with his spade lashed to his back.

One of the longest and most determined impromptu road races in which I ever took part was with some members of the Speedwell Club of Birmingham. We happened to join them outside Salisbury. On inquiry, they laughingly informed us that they were going to dine at Basingstoke, and that they would wait for us there. This settled the matter. I know that I had a tremendous struggle with the man who I chose for a competitor, and when we arrived, with barely a dozen yards between us, both were completely done up. The rest of the party dropped in at intervals. The honours were about divided; but it was one of the most trying and hard-fought contests I have ever seen. At the same time, I am quite ready to admit that such proceedings are not to be included in the legitimate objects of cycling, and that such fast riding would be rewarded by summary justice at the hands of a severe bench of magistrates ready to vindicate the law and prevent excessive speeds on her Majesty's highways.

However, without any such violent exercises, which are better left to young and aspiring athletes, the elderly and more law-abiding cyclist can, by taking things easy and journeying in a more leisurely manner, manage to cover a large amount of ground, and at the same time obtain an insight into the beauties of the country through which he passes.

Before starting out on any tour, the rider should endeavour to get into some sort of condition. He should also make sure that his saddle is one on which he can ride for a long time without inconvenience. A bad or uncomfortable saddle is a thing to be carefully guarded against. It may spoil a holiday completely, for no one can enjoy himself if he is suffering purgatory on an uncomfortable saddle. Next a pair of really comfortable shoes must be selected. The cyclist does not overburden himself with luggage, and, of all things, boots or shoes are most difficult to carry. Do not start in a new pair. They may seem all right for a few hours, but the chemicals which now are used for tanning leather in place of the good old-fashioned oak-bark are liable to irritate the skin, until they have been worked out by use. With the modern ideas of comfort, it is usual to send on a hunting-bag by train, while the rider follows by road. However, if this is impossible, he must limit himself to what he can carry on his cycle. This necessary baggage must, of course, vary according to taste. I used to carry quite a quantity of paraphernalia — camera, plates, slippers, and various odds and ends. The absolutely necessary articles are two spare Jaeger shirts, a pair of extra thin stockings, a cape, and the usual toilet requisites, added to a plentiful supply of pocket-handkerchiefs. Of course, when restricted to such change of attire, one is scarcely the civilized being of society. However, when a rider is going to stay out in the country, away from all haunts of fashion, he probably prefers to be independent of trains, postal service, and the other worries which the high-pressure times we live in bring to all whose address is known.

There are many methods of carrying baggage on a machine, all more or less bad. Try where you will, if the package is at all bulky, it gets in the way. A moderate amount can be stowed in a very thin bag swung from the top tube of the frame; but this, in the narrow-tread machines now so popular, generally chafes the legs, and anything touching even the folds of the knickerbocker annoys a sensitive rider. If a package is secured on the handles, it must be of very small size, or it will be in the way of the brake or lamp. Probably behind the rear wheel is the best place; but, then, a special frame must be made to take it. Jefferson, the great tourist, when engaged in a ride to Central Asia, carried part of his kit in this method, and for any one contemplating a long ride the plan has much to recommend it. Any cycle-maker would build a light tubular frame to fit a machine for about a sovereign, and on this a bag of the old M.I.P. shape can be strapped. One advantage of this method of carrying luggage is that no rear mud-guard is wanted.

Perhaps readers wonder why I have such an inveterate hatred to mud-guards. One reason is, that I have found them most annoying in case I wanted to get at the tyres, while, in addition, they catch every flying particle of grit, and eventually drop it about the region of the rear wheel bearings. Every time a machine is taken through an awkward doorway or wheeled down steps one or the other of these rattle-traps generally receives a blow, soon causing it to become bent out of shape, thus disfiguring the machine. Another reason is that twice I have been precipitated over the handles without warning, owing to stones becoming lodged in the front guard and jambing in the front forks just under the crown.

When the rider has settled the amount of the luggage he will take with him, and where he will stow it, he should then give a thought to the machine. See that it is in perfect order everywhere. Look to the repairing outfit, and make sure that it contains a few patches, and that the rubber solution in the tube is in good order. Often this drys up. On one occasion I remember getting a puncture with a pair of Morgan and Wright tyres. Finding the piece of flint which had caused the mischief, in the hole, I made light of it, and invited my friends to witness one of the quickest repairs on record. I put in the repairing apparatus, but, on squeezing the tube with the special solution in it, failed to extract a drop. It had all dried up. Fortunately some of the ordinary solution was at hand, with which I managed successfully. Since then I have taken good care to test all tubes I carry about for my own use. If the solution gets very thick, it is almost useless, and most tubes allow it to get into that condition if kept for any length of time. See that your spanner will fit all the nuts of the machine. If there is only one which it will not touch, it is certain to be the one which you will have occasion to tighten. I remember being caught in this way myself. My saddle broke a few miles from Stratford-on-Avon; it was raining hard, and finding that I could get a train which would save me some sixty miles, I hurriedly bought a saddle at a local shop, and determined to fix it up in the train. To my horror, the only wrench I had would not touch the nut. Having a small file in my knife, I worked away at the nearest hole for some two or three hours while the journey was in progress, until at last I managed to enlarge it sufficiently to enable the nut to be unscrewed and the new saddle put on. It saved me a nine-mile walk in pouring rain at about midnight.

If a cyclist is contemplating a Continental tour, I should strongly advise a few spare parts being taken in case of accident. Long delays often result from a slight accident, where a little foresight would enable a speedy repair to be made. Local men are sometimes unable to mend a machine in which a nut belonging to some unimportant part has been damaged. Owing to there being no standard size for the threads of the screws in use in the cycling trade, every maker manufactures what he fancies, without regard to the fact that if a screw or nut get lost or damaged no one but himself can readily replace it. This is a matter which should have been settled long ago, for every other trade has its standard threads. Engineers use the Whitworth; gasfitters and brass workers have a standard set of screws of their own; but the cycle maker is above such conveniences. He apparently prefers to work on such lines that in case of a breakdown the machine shall be sent to him; otherwise needless expense must be incurred for a very small matter. Any common nut should not cost more than twopence, but if one of a special size is wanted for a spindle, it may cost anything from a shilling to half a crown. The repair cannot be effected without the use of the screw-cutting lathe, a tool not found in many small workshops. Most men who have a repair of this kind simply "botch" it; they reduce the spindle and recut another thread, a process which, of course, greatly reduces the strength of the screw.

I once remonstrated with a well-known firm of cycle component manufacturers on the drawbacks entailed by the fact that they were using screws different in size to those commonly employed by other makers. They replied that they had been compelled to change them, as all the "garret makers" had adopted their standard, and they were anxious to have something out of the common to distinguish their goods. The folly of such a proceeding is apparent. It would not mean the expenditure of much time or money for any small maker to set to work to cut any screws existing; it would at worst be only a matter of spending a sovereign or two. Yet for the sole purpose of raising this small obstacle all customers and agents of that firm must be seriously inconvenienced. Some day when competition has brought our English makers to their senses, and when illicit gains by company promoting are no more, they will perhaps think upon such small but important matters as these. A council of half a dozen of the leading manufacturers could permanently settle the matter in half an hour. The parts most likely to be wanted and those most easily carried are—

One nut to fit rear wheel spindle.
One nut for front wheel.
A couple of pedal nuts, or a pair of locking pins when screwed-in pedals of B.S.A. pattern are used.
A spare saddle pin and nut.
A spare cotter pin and nut.
And a new rubber block for brake.

The whole will weigh only a few ounces, and will fit into the valise.

If not a member of the Cyclist Touring Club, all intending tourists should seek admission into its ranks. The process of election takes about a month; all directions as to the method of becoming a member and other particulars will be found in my chapter on clubs. For foreign touring it is especially useful, and will often save the amount of the duty on the cycle, which will otherwise have to be deposited at the Custom House. In many other details it smooths the way with the authorities who guard the interests of their respective states at Continental ports.

In planning out a route, assistance can be obtained from one of the well-known road-books. Patterson's is the oldest, and is still of great service, although much of the advice therein as to the condition of the roads is out of date. The Ordinance surveys, when reduced to a scale of about four miles to the inch, are the most reliable maps for tourists. These reduced copies can be obtained in small covers, costing about a shilling each. Some publishers issue maps extending for a radius of about fifty miles round large towns, and these come very handy. County maps are a fraud, and should be avoided. They are too bulky, and no modern rider cares to be cumbered with many useless sheets, some of which will only be of service during a very short distance. It appears a point of honour with the compilers of these out-of-date charts to refuse to give the name of a single place or to continue the line of a road for a mile outside the extremity of the county boundary. Thus many county maps have more blank paper about them than information.

In drawing out a time-table for a tour, remember to make sufficient allowance for unforeseen delays and foul weather. If the distance is too great, either points of interest will have to be missed or part of the route cut short. A fair average distance is about forty miles a day, which will enable a day lost to be easily made up. Of course I am now speaking of genuine touring, and not fast runs, often made for the sake of the ride only. In the latter case as much as a hundred miles a day is often ridden. For instance, in the days of the old Ordinary, one of the favourite tours with my club was from Farnham to London on Thursday evening, from there to Bournemouth on Friday; Saturday was an idle day; Sunday was spent in an easy ride to Amesbury, on Salisbury Plain, and from whence town was reached on the Monday.

One of the best roads out of London is from London to Brighton, a distance of about fifty-two miles; although sufficiently hilly to prevent monotony, it is a very nice bit of going after Croydon is passed. This is the favourite run with Metropolitan cyclists.

The road to Worthing is also popular, though the distance is a trifle further. The going is very good, and the sixty miles can be reeled off with comparative ease.

Probably the most classic highway on which all good cyclists are supposed at some time to make a pilgrimage is the old Portsmouth road; the portion as far as Ripley being a regular promenade on a Sunday morning. Thousands of wheel-men and women pass through Kingston every Sunday. They are to be seen mounted on all sorts and conditions of machines, from the latest inventor's fad to the ancient crock fast tumbling to pieces. The reason for the wonderful popularity of this stretch of road has to be traced back to the early Ordinary days. Old Jack Keen, who was then the champion *par excellence*, discovered the Anchor at Ripley. Other well-known racing men followed his lead. The racing man was not in those days so often the professional as he is in these, and to be seen in his company was presumed to reflect some glory on the ordinary individual. Then the cycling clubs took up the road, and as there was at that time only one inn of which cyclists could be sure, all flocked to the Anchor. Although this inn has lost the charm of the old associations connected with the ownership, it still maintains its popularity among wheelmen, of whom some hundred or so often lunch there on Sunday. There are now in the village several other inns which care for the wants of cyclists.

The main North road is also a favourite with those living north of the Thames. It is flatter on the average than the South roads, and portions lying around Bedford and the Fen country are much used by record breakers.

The Bath road is a fair piece of going after the rider is clear of Hounslow. This used to be the early seat of twenty-four-hour contests, and also was the route over which the London Bicycle Club held their annual hundred miles road race. Probably one of the earliest records to stand for any length of time was that accomplished by Mr. Wat Britten, who rode, about 1878, from London to Bath and back inside the twenty-four hours. This was considered a tremendous feat at the time of its accomplishment, and even now it would be a task considerably above the powers of the ordinary run of riders, excluding, of course, trained men.

The main Birmingham road is one which for some reason is much neglected by road riders. It is good going all the way, and the scenery in parts is lovely. Many deviations can be made, and parts of the country round Warwick and Stratford-on-Avon are well worth exploration. Owing to the absence of tourists on this road, I can vouch for the prices charged at hotels being much lower than is the case on more frequented routes. I prefer leaving London *viâ* Harrow and Rickmansworth to the alternate course through Watford and Berkhampstead. It is not so fast travelling, owing to the hills, but the wooded nature of the surroundings makes up for the extra exertion. It is a peculiar fact that although I have been over this road many dozen times I have never yet had a single puncture, although, as a matter of fact, I have many times expected such a disaster in that desolate stretch between Birmingham and Wolverhampton, where the refuse from small metal works lies about the gutter, and sharp pieces of tin and sheet-iron are to be found at every corner. The small boy of the Midlands is, curiously enough, far more polite than the London urchin.

Talking of small boys, I once witnessed an amusing incident in Notting Hill. A youngster threw his cap at a passing cyclist, who promptly dismounted, and having caught him, proceeded to administer the necessary discipline. Then two elderly gentlemen appeared, who stopped to remonstrate with the cyclist for taking the law into his own hands. I had dismounted to witness the end of the affair, and espied a party of navvies hastening to the scene. I gave the executioner a hint to be off, and as we rode away I looked back and saw the two old gentlemen in the midst of an excited throng, anxious to be revenged on any one who was, as they imagined, connected with the cyclist who was riding away. I think it must have been an excellent lesson for them in minding their own business.

I remember another instance where the ubiquitous small boy was the cause of a pugilistic encounter. A piece of mischief had been suitably rewarded, when the "big brother" appeared. He requested my companion, the previous Editor of this Library, to "hit him once," in the approved "rough" manner of challenge, and obligingly stuck out his face at the same time. To his surprise, his request was immediately complied with; and the last I saw of him was leaning against a wall expressing strong opinions on the manners and habits of cyclists, but quite unfit for a more forcible method of revenge.

The cyclist of modern times has an easy time compared with the pioneers of the sport. Twenty years ago legal rights were undefined, and the rough always considered the cyclist legitimate game. Tramps were ever ready to take advantage of a mishap on a lonely road, and a rider had often to trust for his defence to the strength of his right hand. I well remember the St. Albans coach case, which is a typical incident of those times. The guard of this vehicle actually provided himself with a sort of slung shot at the end of a strong rope, which he flung into the wheels of any passing bicyclist, and having the end of the rope fast to the coach, commanded the situation. At length he was brought to justice; but that such a state of affairs could have existed seems hardly credible nowadays.

CHAPTER X.

RIDES ROUND LONDON.

By C. P. Sisley.

NOTWITHSTANDING the ever-extending zone of unlovely suburbs by which their city is encircled, and the never-ceasing encroachment of the disfiguring hand of the jerry-builder, Londoners may yet claim for their city that it stands pre-eminent among the great centres of population of the world for the beauty and rusticity of the districts by which it is surrounded.

Yet, with that same typical apathy to his immediate surroundings which leaves him ignorant of the world of beauty and art lying hidden away behind the walls of public buildings to which he has free access, the average Londoner, till quite recently, has been but little acquainted with the beauty of the home counties, seldom travelling near home in his search for the picturesque, and reserving his admiration and enthusiasm for the charms of foreign scenes and cities.

It was not till the recent advent of the cheap, easy, and independent transport offered by the cycle, that this lamentable state of things began to pass away; and, even now, many good Londoners are still to be found who, though able to describe the charms of famous Continental resorts with unabating enthusiasm, are still ignorant of the thousand and one charming spots that, although equally capable of delighting the eye and stimulating the mind, remain unknown and unvisited at their very doors. The passage of the entrances and exits afforded by the great highways that meet in London is by no means difficult to the expert cyclist, whilst those who dread the crossing of the suburbs will find ample and frequent railway communication by which they may make their start at a convenient distance from town.

The roads which find most favour in the eyes of London cyclists are the old coaching highways which combine the attractions of good surface and abundance of accommodation. Yet the lanes and bye-ways that branch from these great arteries must by no means be despised by the rider who cycles for enjoyment rather than for sport. As a rule, their surfaces are excellent, whilst they offer a diversity of scene and a tranquillity that, for the most part, is lacking on the more frequented highways.

To Rochester.

A ride, which, though somewhat suburban in character, is nevertheless replete with literary and historical associations, is over the twenty-nine miles that stretch between London and the ancient city of Rochester. Its course runs for the most part over the old Roman road known as Watling Street. Leaving London Bridge by way of the Borough and the Old Kent Road, the tourist will encounter some four miles of stone setts. At New Cross he will follow the left-hand branch of the road that leads through Deptford over the stiff rise of Blackheath Hill to Blackheath itself.

The glory has departed from Blackheath. Its fearsome gibbet has given place to the notice-boards and waste-paper boxes, wherewith the paternal care of the London County Council has given the *coup-de-grace* to a landscape already blasted by devastating hordes of trippers. Yet the close observer will note that, to this day, on the side of Blackheath farthest removed from London, there still blooms a faint trace of its original covering of gorse, whilst here and there he may find a few harebells hidden away in the short grass. It is difficult to imagine that on this spot Julius Cæsar pitched one of his numerous camps, and that here, in the year 1001, the Danes held the Archbishop of Canterbury a captive, after sacking his city and cathedral.

Yet across the heath still runs the straight unswerving road that to this day bears witness to the stubborn energy of the Roman engineers, turning not aside from the steep slope of Shooter's Hill, a rise that can only be ridden by a very strong rider. It is said that Shooter's Hill derives its name from the fact that the old-time archers frequently held shooting competitions in its vicinity. A more sinister derivation is suggested by an old

Kentish historian, who writes that—"It always was a place of much danger and dread to travellers, for the narrowness of the road over it, and the continual lurking nests of thieves among the woods and coppices with which this hill, especially towards the south and west, was much overspread."

Descending the eastern slope of the hill, the road runs through Bexley Heath to Crayford, thirteen miles distant from London. There is a tradition that some caves in the parish of Crayford, several of which are over a hundred feet deep, were made by the Cimri, as places of refuge for their women and children during the wars of the Britons.

Leaving Crayford, two miles of undulating highway, commanding a pleasant view of the Thames valley, bring one downhill into the ancient town of Dartford, situated in a deep hollow upon the little river Darent. The parish church of Dartford stands by the bridge in the centre of the town, and its tall and massive tower, upon which the clock-dial is singularly placed on one side, was built for defensive purposes seven hundred years ago. It possesses considerable historic interest, for not only was part of it erected for the use of Chaucer's pilgrims—ere they forded the river, where the bridge now stands, on their way to the shrine of the good St. Thomas à Becket at Canterbury—but, in the reign of Henry III., the marriage of the Emperor of Germany with Isabella, the King's sister, was celebrated therein. Inside the church is the monument of Sir John Spielman, the worthy German who introduced paper-making into England. From his crest—a fool's cap—which he employed as the distinctive water-mark of his paper, a certain size of writing-paper has taken the universal name of "foolscap." The Bull Inn is another relic of which Dartford should be proud in these days when so few of the old galleried coaching inns are left. It stands in the High Street, opposite the traditional site where Wat Tyler beat out the brains of the poll-tax gatherer. The high road to Dover leaves Dartford by East Hill, a stiff ascent. If the tourist has an hour or so to spare he should take the first turning to the right on the hill and proceed to Darent, some three miles distant, where he may inspect the recently discovered ruins of a large Roman villa. The ruins are situated near Darent church on a farm known as "Burtenshaw's," and may be seen at any hour of the day on payment of the modest fee of one shilling.

At the top of the hill leading from Dartford is the broad flat tableland of Dartford Bridge, anciently called Brent (or Burnt) Heath. Here the road forks. The old Roman road pursues its way straight ahead, past the wall of Cobham Park, coming into the highway again at Rochester Bridge. Taking the road to the left, the tourist should ride through Greenhithe and Gravesend, twenty-two miles from London. Leaving Gravesend, the road emerges into the country again through its suburb of Milton, and ascends a sharp rise in the road to Chalk, a quaint old-world village, whose roadside inn, the Lord Nelson, is one of the last of the numerous houses used by the sailors who were wont in other times to tramp this seafaring road to Chatham or Dover. Four and a half miles distant from this village Gad's Hill is reached, a place of great literary interest, since here was the last home of the great novelist, whose name is so closely identified with this ancient highway. Besides its associations with the name of Charles Dickens, it is famous as the scene, in centuries past, of many notable highway robberies. Here it was, as we read in Henry IV., that the carriers, with "money of the King's, coming over the hill" from Rochester, were robbed by Prince Hal, by Falstaff, Poins, and the rest of that roystering company; and here Falstaff and Poins were robbed in turn by the Prince. A long and steep descent from Gad's Hill leads into Strood, with its long street of queer old houses that terminates in the glorious view of Rochester Bridge, with the castle and cathedral. Rochester Cathedral is one of the smallest in England, nevertheless it is quite as interesting as its more imposing neighbour of Canterbury. Indeed, its nave is much more impressive, being bold and massive Norman work; while that of Canterbury was rebuilt in the last and least artistic period of Gothic architecture. The castle that, from the river banks hard by the cathedral, rises so grandly above the town is remarkable for its lofty and massive keep; one of the grandest in England, built by William de Corbeil, it rises to a height of 120 feet, quite dwarfing the neighbouring cathedral. Admittance to the keep, from the top of which may be seen a magnificent view over the surrounding valley of the Medway, may be obtained by tickets sold at the lodge in the castle grounds for the moderate sum of threepence. On the left-hand side of the ancient High Street stands an interesting timbered mansion, known as Eastgate House, described by Dickens in his unfinished story of "Edwin Droud." Returning from Rochester, the cyclist should ride by the old Roman road through Cobham, at which the ancient hostelry known as the Leather Bottel—a favourite abiding-place of Charles Dickens—forms an ideal place for a high tea. Thence he may pursue his way homeward through Dartford.

To Godstone.

Another favourite pilgrimage of South London cyclists is to Godstone, which is reached from Westminster Bridge by way of Kennington Gate and Streatham, passing through the ancient town of Croydon, distant nine and a quarter miles. The town of Croydon has ever been religious and ecclesiastical in character, and from the days of the Conquest its records have been well preserved. The never-failing Doomsday Book informs us that there was a church in Croydon at the time of the Conquest, and looking still further back, in Lamberd's "Perambulations of Kent" we find a copy of the will of Byrhtric and Aelfwy, made in the year 960, to which is affixed as witness the name of one Aelffie, priest of Croydon, which demonstrates that even in those early days a church existed here. With reference to Croydon's ancient parish church, it is recorded in Aubrey's "Antiquities of Surrey" how, during the fanatical outbreak of the Great Rebellion, "one Bleese was hired for half a crown a day to break the painted windows which were formerly fined." The quaint and pathetic wording of this record leads one to believe that by the time the peccant Bleese had accomplished his day's work that half-crown must have been thoroughly and enthusiastically earned.

Leaving Croydon, we follow the Brighton road in the direction of Purley, and ascending the long up-grade to Warlingham, which forks to the left of the main highway, soon arrive at Sanderstead, a village situated some three miles beyond Croydon, and thirteen miles from London. Sanderstead is mentioned in the will of Duke Alfred, 871 A.D., where it is written "Sonderstede." The name is probably derived from "sandy," and "stede" (place)—a tribute to the sandy nature of the soil, which here makes itself apparent with the improved character of the road. After Sanderstead, the road gradually trends upwards for two miles through somewhat uninteresting and desolate surroundings, to Upper Warlingham. Here the White Lion, a modernized hostelry, still retains some of its old-time charms in the low-pitched raftered bar and wide open hearth of its medieval club-room.

Brayley, in his "History of Surrey," records a quaint custom which prevailed at Warlingham in the seventeenth century. Early in the spring it was the habit of the boys of the parish to visit the various orchards and to "whip" the apple trees. This was supposed to secure a plentiful crop of apples. After the ceremony the boys carried a small bag to the house, which the mistress filled with flour.

In these degenerate days this pleasant custom seems to have fallen into abeyance. It has doubtless given place to the quaint conceit of stone-throwing at the expense of the passing cyclist.

The village church stands in a field some five hundred yards from the road. It has been there since Plantagenet days, for its prevailing style is early English. A modern stained-glass window on the south side commemorates the fact that the first book of Common Prayer of Edward VI. was first used within its walls.

About a mile beyond Warlingham, as the road rises more abruptly to the crown of Titsey Hill, we reach Worms Heath, a strangely desolate patch of common land, from which, to the northward and eastward, a fine view may be obtained of the Crystal Palace, ubiquitous in the panoramas of these parts, to that familiar landmark, Knockholt Beeches. It is difficult to realize that this lonely heath, so suggestive of adders and Shakespearian witches, is distant but some fifteen miles from Charing Cross.

Three miles and a half beyond Warlingham, and seventeen from our starting-point, we find ourselves at the top of Titsey Hill. Here, by turning to the right, a short cross-country run will bring the rider on the crown of Botley Hill, whence may be obtained a fine view of the Oxted Valley, which on neighbouring Titsey is somewhat obscured by the thickly growing woods.

The road at Titsey Hill at first descends gradually, and afterwards winds more abruptly down the

Horse-Shoe Clump Hill, Esher Side.
(From Photograph by R. W. Thomas, 41, Cheapside, E.C.)

southern side of the range of chalk hills that extends from Guildford on the West to Madamscourt on the east.

In descending Titsey it is not advisable for others than expert cyclists to proceed beyond the N.C.U. danger-board, for at the first bend the road descends a steep and dangerous grade.

Here we are almost on the county boundary, which is situate less than half a mile to the east.

Near the foot of the hill, on the left of the road, stands Titsey Church, whose picturesque lych gate, backed by the grey distance of the valley, forms a most pleasing picture.

On the opposite side of the road stands Titsey Place, the residence of Mr. Leveson-Gower, a descendant of the Gresham family, who at one time owned most of the land between this spot and Warlingham.

A short run down into the valley brings us to Limpsfield, a picturesque, straggling village, crowned by a quaint and somewhat rudely-fashioned church which rejoices in the possession of a clock and a peal of six bells, two of which, dated 1350 and 1745 respectively, have recently been recast.

Turning to the right, we follow the road which runs with a downgrade to Oxted, a mile and a quarter distant from Limpsfield, a village much frequented by landscape artists, and, turning to the right of Limpsfield, take the road that runs with a short precipitous rise into the village of Oxted. Another short ride of two miles and three-quarters over the undulating switchback stretch of road that lies between Oxted and Godstone brings us to the ancient White Hart, likewise known as the Clayton Arms, that faces Godstone Green. Like Godstone—the origin of which is shrouded in some mystery, although it is supposed to take its name from the "good stone" quarried in the neighbourhood — the Clayton Arms is of considerable antiquity. It was erected in 1380, during the reign of Richard II. In all those seven hundred years the olde White Harte has altered little in its structural outlines. The old stable-yard, where for years the coast-bound coaches pulled in to change horses, still remains, whilst abutting on the hard white road, is the coachman's room, where in the old days driver and guard were wont to fraternize with the local sportsmen. Across the beams of the ancient dining-hall upstairs the rider is welcomed by the faded lettering of an old inscription—

"Nowe Goode Digestion Wayte on Appeytyte: and Healthe on Bothe."

Leaving Godstone, a ride of eight miles brings us to Riddlesdown, through which, by way of Purley, we soon find our way back to Croydon, and thence to London.

The Oxford road; Chalfont and Beaconsfield.

West London cyclists may claim to possess the best exit over traffic-laden streets of the great city. From Marble Arch through Bayswater, Shepherds' Bush and Acton, as far as Ealing Common, stretches the superb surface of wood pavement. At Ealing the wood gives place to a very fair macadam highway, which in the space of two miles and a quarter, brings one to the dismal walls of Hanwell Lunatic Asylum. The gradual and imperceptible upgrade of the Oxford road, passing under the main line of the Great Western Railway, brings us to the picturesque village of Hillingdon. Opposite the ancient village church stands a fine red-brick Elizabethan mansion known as Cedar House, where at one time resided General Richard Russell, grandson of Oliver Cromwell. In the garden stands a famous cedar, from which the mansion takes its name, which Gilpin, in his "Forest Trees," published in 1791, mentions as the finest cedar he had ever seen. Directly opposite the church stands one of the principal inns, the Red Lion, which has been a noted house in its day. Here, during his escape from the siege of Oxford by Fairfax, in April, 1646, Charles I. stayed awhile with his chaplain and Ashburnham, his groom of the chamber. In the ancient churchyard is buried John Rich, actor and lessee of Covent Garden Theatre, first and most famous of English harlequins, a part which he played under the assumed name of "Lun." His "matchless art and whim" as bearer of the magic wand of pantomime are recorded by Garrick. He died in the year 1761, in the neighbouring Cowley Grove, in a house which is stated to have been previously inhabited, for many years, by Booth, the famous tragedian.

Leaving Hillingdon by the Oxford road, a distance of a mile and a half brings us to historic Uxbridge, a long, straggling, and not unpicturesque town, much frequented by angling enthusiasts, who find good sport in the waters of the twin rivers, formed by the junction of the Colne, Gade Verum, Chess, and Misbourne brooks.

The chief historical feature of Uxbridge is the old Crown and Treaty House, an inn which stands at the foot of the hill near the bridge. At this house, just before the beginning of the Civil War, the Royalists and Parliamentarians met together in the vain hope of bringing their differences to a friendly settlement.

Here may be seen the oak-panelled room in which the fruitless conference took place, and also the richly-carved oak chamber, the presence-chamber occupied by the king during the negotiations.

The Treaty House was visited more than once by Edmund Burke, who, on his way between Beaconsfield and London, would stop here to feed and water his horses. Mr. John Morley, in his "English Men of Letters," relates how he delighted to point out the house at Uxbridge where Charles I. had carried on the negotiations with Parliamentary Commissioners.

Taking our leave of the Crown and Treaty House, we cross the bridge over the Colne, and ride into the county of Buckinghamshire. A ride of two miles and a quarter brings us to

Redhill, the only rise of any importance to be encountered on this road. At Tatling End, eighteen miles from London, we take the turning to the right, leading towards the two picturesque Buckinghamshire villages known as the Chalfonts, descending a sharp dip into the Misbourne Valley. A ride of two miles and a half brings us to the quaint old-world village of Chalfont St. Peters. Although but twenty and a half miles from London, Chalfont St. Peters, untouched by the levelling influence of the railway and consequent excursionists, has preserved much of its old-world charm. The village consists of a straggling street of old red brick and timbered houses, endowed with a wealth of colour, infinitely refreshing to the eye, wearied of the dull grey monotone of London streets. Across the roadway the Misbourne brook meanders haphazard, and fording its shallow waters we pedal on over the two miles that separate us from the neighbouring Chalfont St. Giles.

This picturesque village, once the stronghold of Quakerism, is intimately associated with the name of William Penn, founder of Pennsylvania, who lies buried not far distant in the lonely burialground of the old Quaker meeting-house at Jordans, which lies between this place and Beaconsfield. A quaint old lych gate, turning on a pivot, gives entrance to the churchyard, and forms a picturesque subject for the pencil of the artist or the snap-shot of the photographer's picture-box.

On the left-hand side of the road we find the cottage occupied by Milton, who here sought refuge from the ravages of the Great Plague. Here was written "Paradise Lost," and here, too, the subject of "Paradise Regained" was suggested by Milton's Quaker friend Ellwood, who at that time was tutor to Penn's family at Chalfont Grange. Those who are not parishioners of Chalfont must pay the modest toll of sixpence charged for admittance to this classic cottage. In the small room that once was Milton's study stands the table whereon the immortal poem was written, together with a museum of different editions of Milton's works.

Leaving the humble red brick edifice, we push on to the Jordans, taking a turning to the left a few hundred yards past the village, which with a down-hill run of another mile brings us to the old Quaker meeting-house, reputed as the first established in England. Here we see the modest headstones that mark the resting-place of William Penn and his first and second wives, Guli and Hannah Penn. It is an interesting fact that Guli Penn was a great friend of Milton, and used very often to go over to the house of the blind poet to solace his darkness with music and song.

The old meeting-house was built in the reign of James II., when, owing largely to the influence of Penn at Court, the Quakers had begun to enjoy some measure of toleration.

Two meetings are still held yearly, when the Friends re-assemble in the homely whitewashed and oak-panelled meeting-room to keep green the memory of the great founder of Pennsylvania.

It is with regret that we tear ourselves away from this tranquil spot, and take the road once more through a magnificent avenue of those splendid beeches which form so important a feature in Buckinghamshire landscape.

Another short spin of two miles brings us to the Oxford road once more, in the vicinity of Beaconsfield, in whose old-time churchyard the poet Waller lies buried. Here also lies the great

Burke, who owned the estate called "Gregories" in this neighbourhood.

From Beaconsfield we turn our wheel towards London, and following the gentle downgrade of the Oxford road once more, make short work of the twenty-three miles and a half that lay between that village and the Marble Arch.

Essex; Brentwood and Romford.

Essex roads enjoy a proverbially bad reputation amongst London cyclists. Certainly few of the roads in the matter of surface can be compared with those of the southern counties. Yet, to the pneumatic-shod wheel, the inferiority of the surface is fully compensated for by the absence of stiff grades, and we can but think that most of the objections against the quality of the Essex roads are born of a prejudice that dates back to the days of spider wheels and solid tyres.

In the matter of landscape, too, although it cannot claim the varied charms of Kent, Surrey, and Sussex, the county of Essex possesses its own particular beauties. "If the landscape is unpleasing, look at the sky," a famous landscape painter is reported once to have remarked, and it may be justly said of Essex that what it lacks in beauty of form is amply compensated by its atmosphere, since from the humid nature of its soil it derives the soft greyness that in the eyes of the painter forms the chief charm of English landscape.

The rider who possesses sufficient hardihood to cross the desert of bricks and mortar that lies to the east of London will find that, as the northern boundary of the Thames estuary and the landing-place of successive invasions, Essex is rich in historical interest. The miles of embankment that bind her shores are a lasting monument to the Roman occupation, and many traces of the old-time settlement of the East Anglians still exist for the delight of the antiquarian and as food for the speculation of the philosopher.

To reach Essex the rider must wend his way eastward by Whitechapel Church, then over the classic and maritine surroundings of Ratcliffe Highway to Limehouse. The passage of this portion of the road is rough in more senses than one. There is a distinctly maritime flavour in this interesting district, which insensibly reminds us of Captain Cuttle and the immortal Bunsby as we coast along the northern boundary of the Isle of Dogs.

Leaving this uninvitingly-named locality, a ride of some four miles brings us by the Royal Albert docks to East Ham. Here the houses begin to thin out into detached rows of small cottages, standing in aimless fashion, oases of bricks and dirt, in a hopeless prospect of waste land and cabbage fields.

This dreary prospect, however, is to some extent redeemed by the stately outlines of the great ocean steamers that rise above the monotony of the endless lines of warehouses. Behind the towering forest of masts and smoke-stacks, floating in a haze of golden brown smoke, rises the outline of Woolwich Academy, whilst across the river to the southward, in a clearer atmosphere, the bold profile of Bostal Heath stands out clearly against the sky.

A ride of a mile brings us to the town of Barking, which, notwithstanding the prosaic suggestion of its name, is a town of considerable historical associations, and not entirely devoid of picturesque surroundings. Here was once the site of Barking Abbey, founded by St. Erkenwald, grandson of Uffa, the first Saxon king of the East Angles, and also the first bishop who sat in the See of London after the erection of the cathedral of St. Paul's by Ethelbert. The abbey was burned by the Danes, A.D. 870, and after lying in ruins for a century, was rebuilt by King Edgar, as an offering in atonement for an insult offered by him to a holy recluse, whom he afterwards installed as Abbess of Barking, and who, at her death, was canonized as St. Wulphilda.

Under the Saxon Abbess, Barking became one of the sacred spots of England, and here, after the Conquest, the Conqueror is said to have established his court.

The convent under Queen Maude, Adeliza, and the great Norman ladies, became one of the chief places of education for the daughters of the noble families.

Of the ancient fabric nothing is now left, except the solitary embattled gateway that guards the entrance to the churchyard. It was well known as the "Chapel of the Holy Rood Left atte Gate," but is now commonly called the Fire-Bell Gate, from a tradition that it once contained the bell rung for curfew and alarms of fire.

Riding down the High Street, past the ancient Market House, said to have been built by Queen Elizabeth, we turn to the left and follow the road that runs eastward to Rainham, four miles and a half distant.

After leaving Barking we find ourselves amid green fields and flourishing market-gardens, intensely refreshing to the eye after the desert of bricks and mortar through which we have passed.

The macadam road, too, improves as we ride eastward. Here and there, between the hedges, we obtain delightful glimpses of the broad bosom of the river and the Kentish hills beyond.

Passing through Rainham, a quaint little village twelve and a half miles from London, we ride by the hamlet of Wennington to Purfleet, three miles distant.

Here we meet with the first slope of any importance, as we ride over the chalk hillock that here overlooks the river.

From the roadway may be obtained a splendid view of the river, in which the training-ship *Cornwall* occupies a prominent position.

On the Kentish shore opposite are moored the floating hospital ships. Of these, the *Castalia*, a twin steamer, constructed with the object of banishing the horrors of the Channel crossing, is now converted into a floating village of corrugated iron fever wards. Another of the ships enjoys distinction as the last "wooden wall" constructed for the English navy.

Retracing our road from Purfleet, a mile and a quarter, we turn to the right, and proceed to Aveley, a mile and three-quarters distant.

The village church once possessed a lofty and beautiful spire, but this was blown down in the same storm that was responsible for the great Dagenham Breach.

Another short run of some five miles brings us to North Ockenden, also called "Wokindon" and "Ockendon of the Seven Fountains," from the number of springs in the parish.

This parish formerly formed part of the possessions of King Harold II.

To the right of the village green stands a fine old round-towered church, dedicated to St. Mary Magdalene. The chapel on the north side, dedicated to the Virgin, and for many years the burial-place of successive lords of the manor, still retains some ancient heraldic glass; and in the building there are many ancient and valuable memorials to the families of Poyntz and Littleton, from the reign of King Henry IV. to 1714. Following the road northwards across a wide valley by Great Warley, a long upgrade of four miles brings us to Brentwood.

Originally called "Burntwood," it is described in Morant's "History of Essex" as being the chief hamlet in the parish of South Weald, and the first trustworthy record of its somewhat obscure history connects it with Waltham Abbey, which monastery being bestowed by the pious Edward the Confessor on Harold, that nobleman endowed it with seventeen lordships, one of which was South Weald and its hamlets.

In the year 1221 a chapel was built at Brentwood, and was dedicated to St. Thomas à Becket. The chaplain derived his income from the gifts of travellers on the road, and such pilgrims who came to worship at the shrine of St. Thomas.

A gate on the highway from Ongar, through which the devotees passed on their way to their shrine, was called Pilgrim's Hatch, a name which survives even to this day.

A portion of this chapel still remains in the High Street, through which we follow the road Londonwards.

A ride of six miles over a somewhat rough macadam road brings us to old-time Romford.

In the Church of St. Edward the Confessor stands a stately monument to the memory of St. Anthony Cook, preceptor to King Edward VI., who died June 11, 1576. The Latin inscription on this monument, enumerating the various members of his family, is supposed to have been written by his daughters, who were among the blue stockings of that studious court.

Of the remaining twelve miles of our ride, through Stratford and Whitechapel, it will suffice to say that, for those who are unused to the traffic-riding, the Great Eastern Railway from Stratford is a safer method of travelling than the bicycle.

The Ripley Road.

Any account of roads favoured by London cyclists would be incomplete without some reference to the Ripley Road, as the first twenty-four miles of the old Portsmouth coach road is called by the vast legion of cyclists who ride to and fro over its magnificent surface between London and the little village of Ripley, which has become famous as "The Mecca of all true cyclists," a term originated by the late Earl of Albemarle, who from the earliest days of cycling was a devoted follower of the sport. Following the Fulham Road, we negotiate, on crossing the Thames by Putney Bridge, the somewhat steep ascent of Putney Hill. Crossing Wimbledon Common, we follow the main road to Kingston-on-Thames, whence a ride of four miles brings us to Esher by way of Thames Ditton. On the left-hand side of the highway stands the Bear Hotel, an old-fashioned inn with some slight pretensions to historical interest, Louis Philippe having stopped there on his flight from France in 1848. Leaving Esher, we pass the Palace of Claremont, now the residence of H.R.H. the Duchess of Albany, and on our right Esher Court Common, one of the many palaces once inhabited by Cardinal Wolsey. A little further on we pass over the Fair Mile, so called because it is said to be the only level mile on the road between London and Guildford. From Fair Mile a ride of a few minutes brings us to Cobham, where Mr. Pickwick made the memorable discovery of the mysteriously-inscribed stone which added so much glory to his already illustrious name, notwithstanding the ungenerous aspersions of the malignant Blotton.

Crossing the river Mole by its old-fashioned stone bridge, we journey past the picturesque pine woods that border the road on either side by Wisley Heath, and at the end of the fourth mile from Cobham we arrive at the famous Anchor at Ripley.

CHAPTER XI.

ON RACING AND TRAINING.

NO sooner does a man excel at any sport than it is his wish to prove his superiority in public. Contests on the modern athletic grounds take the place of the games of ancient Greece; it is here that our youths are enabled to complete the education of the playing fields at school, and become finally endowed with those qualities of pluck, determination, and fair play which are so dear to all Englishmen. It is a good thing for every young man to go into training at some time, even if he has not the necessary physical qualification to ensure success in public competitions. It will go far to teach him to limit his indulgence in the good things of life, and to avoid excesses, which are simply fatal to any athlete. The old idea of training has now quite exploded, and the rigorous treatment of bygone times is no more. Then raw steaks and other viands savouring of cannibalistic practices were deemed the fit and proper diet for the aspiring athlete. Training has had the search-light of science turned upon it and its vagaries; as I shall show later on, it is now no longer either unpleasant or hurtful.

Cycle racing has, I am sorry to admit, degenerated woefully of late years, and among our best men a genuine amateur is hard to find. The great struggle amongst makers of machines and, worse still, amongst tyre companies, has brought about a state of things in the amateur ranks which cannot be compared to those existing in any other sport. There is only one bright side to the dismal outlook of amateur wheeling. Most of the subsidized amateurs run to win, and, as their remuneration really depends upon their reputations, which in turn result from the records they make, wilfully losing a race is an amusement rarely indulged in, for the simple reason that it does not pay.

In the early days of cycle racing, before the sport was popular enough to have a governing body of its own, two classes of riders only existed. The large body of gentlemen amateurs was distinctly separated from the smaller number of professionals. The reason for the decadence of the amateur must be attributed to a large extent to the repeal of the clause in the early amateur definition excluding the "mechanic, artisan, or labourer." It is very probable that a body of amateurs will arise and reintroduce this clause, with several others of a more stringent nature, to enable those who are purely amateurs to again indulge in sport untainted by professionals in disguise.

About 1880 the ranks of the professional racing cyclists became remarkably thin. Contests between the leading lights of the times failed to excite much attention, and as the riders were averse to competing merely for their own stakes, races became few and far between. When they did take place, they were often only of the nature of what was known as a "barney;" in other words, a meeting arranged for the purposes of betting. Practically, professional racing may be said to have been dead for over a dozen years. It is only during the past two years that it has been revived on a more healthy basis, and may eventually prove the solution of the amateur question.

On the death of professional racing, those riders whose means were small, and whose scruples still smaller, found out that in the ranks of amateurs they could make enough money to more than pay their expenses. The makers had discovered that the public placed a high value on the type of machine which was most successful in path contests; and the first step on the road to ruin was the presentation to good riders of machines on which they were expected to compete. Some riders accepted machines, and, as a matter of course, it often happened that they found themselves possessed of several machines at the same time. In that case they chose the machine which suited them best, and sold the others. The next step in the downward grade was when the manufacturers found it necessary to add a cash payment to satisfy the expenses of a competitor who toured the country for the purpose of attending cycle meetings. Competition soon caused riders to raise these payments to sums far and away above what they actually spent. The augmented amounts were cheerfully paid by makers, only too glad to be able to secure the services of a good man. Numbers of young men who posed as amateurs gave up good situations, and lived comfortably on such subsidies. The evil continued to grow, until any one of note could, with almost certainty, be described as a M.A., a title which, in cycling parlance, signified not a master of arts, but simply a maker's amateur. The National Cyclist Union, the great governing body connected with cycling, did all they could to suppress this state of affairs, but their efforts were useless. It was a well-known fact that many of the best men were in the employ of certain makers. It was not until about the middle of 1896 that sweeping suspensions of so-called amateurs and the reintroduction of professional racing caused a partial cleansing of the Augæan stables.

The evolution of the maker's amateur has been the sole cause of the loss of tone in cycle racing.

The sport in its early days seemed to have a brilliant future before it. It was patronized by members of the Universities, and generally afforded the public the most exciting item in the programme at any athletic meeting. But at the present time it has so degenerated that men of position are loth to appear in the company of latter-day racing men. It is my most earnest hope that shortly a better state of affairs will prevail, and that gentlemen will be in the majority among competitors at amateur races.

The history of cycle racing is short. No sooner had the old "bone-shaker" become at all common than men grew anxious to display their capabilities in contests. Sports committees introduced a bicycle race into their programmes, and champions arose. The Amateur Athletic Club held the first championship in 1871, which was won by Mr. H. P. Whiting, who, with one interruption, was successful in the following years until 1875, when the Hon. I. G. N. Keith Falconer came upon the scene, and carried off the four-mile race, which then constituted the bicycle championship. This gentleman—who, it is needless to say, never had the slightest taint of anything savouring of professionalism—was in his time a wonderful rider, and, in company with Herbert Liddel Cortis, upheld the honour of the amateurs in the inter-professional races held, with the sanction of the Bicycle Union, at Cambridge. Cortis was a giant in his time, and was one of the most popular riders with the public, who admired his marvellous pluck and endurance. He always was to be seen at scratch in handicaps, and seemed to have a happy knack of pulling races out of the fire. His spurts were wonderful. When the bell rang for the last lap his chance seemed hopeless. But somehow or other, as the home straight was neared, he was seen to be gradually gaining ground, and at the approach to the post seemed to have a faint chance; then suddenly he would dash through his men as if they were standing still, and secure the judge's verdict by a bare foot. For a long time the handicappers never could get his correct mark; penalize him as they would, he won in despite of them.

In those days the advantage of a long reach was indispensable to fast travelling. The bigger wheel a man could ride the slower was the pedalling, and consequently the greater advantage he secured over his less fortunate competitors. All our early champions were tall men. Probably the smallest wheel ever used with success in a championship was about fifty-five inches, which required a man not less than five feet eight inches to ride. Cortis, Keith Falconer, Hillier, Palmer, Wyndham, Furnival, Osmond, Syner, and others of note, all bestrode machines of about fifty-eight inches or over. Now our racing men can choose what effective value they please for their driving wheel. So long as they are strong enough to push it, a wheel can be geared to 150 if desired.

Interest in professional racing in the old times centred about John Keen and his struggles with Freddy Cooper, the only man who could successfully cope with him. Many other lesser lights came on the scene, but their names are not of interest. Perhaps, however, I may mention Waller, the hero of early long-distance racing, who won fame in the six days' races held at the Agricultural Hall, London.

Modern racing is a very different thing to that in my time. Now special tracks exist, built with every regard for speed. The corners are carefully laid out, and as much care bestowed on calculating the incline of the banking as is given by a railway engineer to setting out a curve. The old-fashioned tracks were those used by pedestrians, and not only had no banking whatever, but often sloped down to the outside edge. No modern Safety could be ridden round them at anything like the speeds now the rule, and it is questionable if very much better times could be made now on such tracks as old Lillie Bridge than were done on the old Ordinary. The amount of banking on modern race paths is such that when Mr. Percy Letchford, the ex-tricycle champion, attempted to ride a three-wheeler round the one at Olympia, he fell off on the inside from want of confidence at first start to take it at a sufficiently high rate of speed.

The materials from which cycle tracks are now made may be classified under two heads—dirt tracks, and those with cement or wooden surfaces. Cement is undoubtedly the fastest material on which a machine can be propelled. So great an amount of attention has been bestowed upon the selection of a proper substance, that experts exist who make a speciality of designing tracks, and patents have been taken out for compounds to coat the surface. A really good track is one which is not only properly set out as regards curves and banking, but which possesses a surface that will give a proper grip to the tyres, wet or dry. Catford, Wood Green, and Herne Hill well represent modern race paths, and now another addition has been made to Metropolitan facilities for racing and training in the shape of a particularly fine track at the Crystal Palace. The old one, in its day, was the best in existence, and it was there that Cortis first covered twenty miles inside the hour, the actual time being fifty-eight minutes and some odd seconds. This feat, considered wonderful then, would have been accomplished about two years previously at the recreation ground, Surbiton, had not an unfortunate accident marred the proceedings and caused the retirement of a very promising young rider who was assisting in pace-making.

Road racing, at one time an important branch of the sport, has now been effectually brought to a close. The increased speeds at which modern cycles travel has rendered the practice of racing on the highway positively dangerous to its other users, and where the N.C.U. failed to effect a cure the strong arm of the law succeeded. Road races and time trials should not be countenanced for a less distance than such as the Land's End to John o' Groat's course. This when first attempted took a party from London about seventeen days. Keith Falconer rode over the present course in 1878, sleeping comfortably at nights, as any tourist would do, and beat the then existing record by about two days, reducing the time to thirteen days. G. P. Mills, the finest long-distance rider that cycling has yet produced, has perhaps been more frequently over this stretch of road than any other man living. To him is due the credit of inaugurating the system of riding right through without any more sleep than can be snatched in a ferry boat at one point of the journey.

It is difficult for unathletic folk to imagine what it means to ride continuously for a distance of about eight hundred and sixty miles, with only the barest stops for meals. The speed, too, is not one which many cyclists would be able to maintain for more than an hour or two. A start at about twenty miles an hour is made from Land's End; then the rider, assisted by pace-makers in frequent relays, rides straight away without a stop, save of most limited nature, until the other extremity of the kingdom is reached. It is a marvel to me how the feat is done. Such men as Mills, Edge, and Carlisle must have magnificent constitutions, endowed with an enormous stock of vitality. The present record is just over three days. It is not likely to be brought down much under the seventy-two hours.

Since the decline of short-distance racing on the road, path contests over longer distances and for certain periods of time have become the fashion. We now have races for six, twelve, and twenty-four hours—"twice round the clock," as racing men style it. This latter is a most exhausting performance, and the distances accomplished are simply marvellous. The earliest long-distance amateur contest on the path which I can remember was a match between Mr. George Lacy Hillier and the late Major Knox Holmes, the former giving a mile start for each year's difference in their respective ages. This was in 1883. Before that, however, professionals had emulated the example of pedestrians, and gone in for six days' contests—"long wobbles," as they were dubbed. These originated at the

Agricultural Hall; and in 1879, Waller, an ex-collier, accomplished a distance of 1172 miles in six days, doing on the first day 253 miles. After a lapse of many years, the Cuca Cup race was inaugurated, and it has since become an annual institution. So great was the success of the earlier attempts at long-distance path racing as regards pecuniary benefit to the promoters, that during the years 1895–6 an absurd number of these contests were held. There can be no doubt that the terrible strain permanently injures the constitutions of many of the riders who take part in them.

The earliest Cuca race was won by Mr. Frank Shorland, who in his time was the best medium-distance racer of the day. His total of 413 miles in the first twenty-four hours' race was a great advance on the then existing record; but since this time the figures have gone up by leaps and bounds, until at present there seems every possibility of six hundred miles being eventually traversed—more, in fact, than can often be accomplished in railway travelling when off the main lines.

Short-distance path contests have shown still greater increase of speed. In the days of Keen and Cooper (1878 and 1879) the mile record stood at about two and three-quarter minutes. Slices have been continually taken off it ever since, and now we hear of 1760 yards being ridden "in America" in only three seconds over the even time of one minute! Tracks, machines, and the air tyre are partly the cause of these phenomenal times; but still more are they due to an abuse—for I can call it nothing else—which has crept in, of allowing the rider the assistance of pace-makers. These riders maintain his speed, and, what is almost as important, afford him substantial aid by cutting the wind and establishing a suction of the air to help his progress. To such an extent has the evil of pace-making grown, that given two good men, one considerably better than the other, it would be hopeless for the superior man to make a match, unless he could count on efficient pace-making, The so-called "great chain" matches, which were run with a view to proving the alleged immense superiority of the Simpson chain, were in reality only a trial of strength between rival crews of pace-makers, in which the trained skill and organization of the Gladiator teams carried all, excepting the first match, before them.

To maintain a sufficient number of riders to properly pace any contest lasting over a distance is a most expensive proceeding. The members of the crews expect standing salary and an extra bonus for their efforts when the man they assist breaks record. The favourite machines in use for this purpose are the quadricycle, triplet, and to a less extent the tandem. The advantage of the former is not so much that increased speed is attainable, but that it runs steadier, while the greater number of riders breaks up the wind resistance, and causes more suction to help the rider following in its wake. Pace-making has now become a regular art, and the system on which the Gladiator teams are organized is worth seeing. So soon as one pacing implement has circled a few laps and its crew become tired, then another comes swooping along, and, without a second being wasted, mechanically picks up the place previously occupied by the retiring crew.

The 'cute Yankees have gone one better than the English in the art of pace-making. I have mentioned that they claim to have ridden the mile in sixty-three seconds, but on this occasion they dispensed with the human pace-maker altogether. Instead they laid down a straight track inside the four-foot way of a railway line. Then a locomotive, drawing a special car carrying the time-keepers and other officials connected with the trial, did the pacing. The car was provided with a wind screen, extending down to within an inch of the track. In the centre of this screen was a white line for the rider to steer by. Half a mile was allowed to get up speed, and a similar distance to slow down; the middle distance of one mile being marked by "torpedoes" —or fog signals, as we call them. The rider is supposed to have followed the train with comparative ease, and on one slight inequality in the track to have actually back pedalled. I give the account of the performance as it appeared in the papers, and should be sorry to vouch that it ever took place at all. It is interesting, however, as showing to what a pitch the evil of pace-making has arrived.

The origin of this latter-day invention for spoiling sport is due to the fact that riders in the old scratch races and championships were accustomed to ride with almost scientific skill, and "used their heads," as it is called, in the same way as a good jockey. The crowd did not like methods which rarely resulted in records, and to get over the difficulty, the promoters of races introduced pace-making to draw the nimble sixpences of the gallery. From a small beginning the evil has grown with a rapidity only equalled by microbes in a culture bath.

Having given my readers a short history of the sport, in which I have only shortly touched on the landmarks of cycle racing, I must now endeavour to give the aspiring athlete a few hints on getting into condition for the racing track. The object of training is to bring a man to the post in the best possible health, and not merely to reduce his weight, as in the case of jockeys and feather-weight pugilists. To succeed in this is the aim of all latter-day trainers, and the golden rule which is the foundation of success is for the trainer to be able to accurately gauge his man's capacity for work. Too much hard work will as surely ruin a man's chances as too little; of the two evils, choose the latter. Regularity in living is of course absolutely necessary. No special system of diet can be laid down. The rider may eat whatever is both nutritious and easily digestible. If he has any trouble in digesting his food, it will assuredly do him no good. Of course it must be wholesome. Porridge used to be considered the staple dish for breakfast. It doubtless suits some people, though personally I took a violent dislike to it. But that "one man's meat is another man's poison" is an old saying. It is almost impossible to generalize on the best training diet, for some men seem to get fit on any food; and now that vegetarians sometimes shine as athletes the old theories seem quite exploded. The rider must find out for himself what suits him best. A small amount of alcohol taken in the form of beer or wine—not spirits—is often good, and the latest medical opinion is that it acts as an aid to digestion. At the same time if the novice has not been in the habit of taking anything of that nature it would be far from wise for him to commence its use. No violent change in the mode of life is necessary or advisable.

Half a pint of beer should be enough for lunch, and if the want is felt, a similar quantity at night.

Smoking is a bad habit that must be given up. As every athlete knows, its effect upon the heart is most deleterious. Young men are not like old. They can readily abandon a practice like the use of tobacco, and in a day or two feel no longer in need of its soothing influences. It is comparatively an easy task to get a youngster into condition, whereas a man approaching middle age requires careful training for months. When a young rider has satisfactorily settled the food question according to his own knowledge of his digestive powers, and has followed the simple advice I have given on other points, he will have done everything necessary as far as that part of training is concerned.

What amount of exercise should be taken? This depends upon the nature of the contests in which the coming champion expects to shine. If he is only to be a short-distance man a far less severe course of preparation will be necessary than if he intended to enter for long and trying races. The short-distance man has to cultivate speed and nothing but speed. Unless he can sprint with the best of his competitors staying power is useless. Once let the art of fast riding be attained, staying power will follow. It is astonishing how a very little abatement of pace gives relief, and a speed which would take all out of a man in a lap will, if moderated but slightly, feel to the rider comparatively slow. Hence it is no use for the sprinter to remain on the track for long periods at a stretch. Harm only will follow. Rather let the rider go slowly round for a few laps until he gets warmed to his work, and then sprint for as far and as fast as he can. Directly he feels that he is no longer doing his best, let him take an easy; when his wind has been regained he can put in another fast lap. Good pace-making in practice is of great importance, and he should ask permission of better men than himself to be allowed to follow for a short time. It is hardly track etiquette for a rider to use a man as an involuntary pace-maker unless he knows him or has first obtained his permission. If a stranger to the path, friends will soon be made, and others in the same plight will be glad to obtain assistance from him in the shape of friendly spurts. At old Stanford Bridge the trains used to run alongside the home straight, and a rider by trying his speed against them as they came in to the station could get thoroughly pumped out.

After the work on the path, which should be continued until the rider is beginning to feel well tired, and the perspiration has commenced to flow freely, he should retire to the dressing-room, seat himself in a position where he will be out of the way of the door and its attendant draughts, and commence a process of rubbing down with a rather rough towel. This will increase the perspiration, and the friction will help to open the pores of the skin. He should not hurry the process. If he can afford to obtain the help of a professional trainer, he must insist on his proceeding leisurely. When the rider finds that he is no longer inclined to perspire, he should walk into the shower-bath, which, if cold, must be taken immediately after the towel friction, and be but momentary. If warm water can be obtained, a preliminary warm *douche* is advisable, to be followed by the cold. Let him beware of colds, and during winter see that his clothing is sufficiently warm.

Dressing-rooms, though much improved, are still often wanting in comfort. I should advise the embryo racing man to carry his outfit in a small hand-bag, and have the few clothes used for racing and training properly aired and dried at home. For this purpose he will want a couple of outfits for training and a spare one for actual contests. Those used for training can be made from cheaper material than the more finished outfit in which he will appear before the public. Black cashmere for the pants, and a thin Indian vest added to a pair of shoes, are enough for training in the summer months. In wet or cold weather I should recommend a moderately thin sweater and pants of thicker material. The actual costume used for races should be of silk or satin neatly trimmed. If white is chosen, let it be spotless, not of a dirty grey. Tastes vary on the path, and old hands generally prefer plain black or white without trimming, while novices come out in all the colours of the rainbow. I have not forgotten my initial appearance on a London path. My colours were exceedingly vivid ; so much so, indeed, that I never had the pluck to wear them after the first trial, about eighteen years ago.

Shoes are generally worn without socks or stockings, so that they must fit sufficiently tight

A Run Past the Grand Stand.
(*From Photograph by Wall Brothers, St. Kilda.*)

to obviate the danger of their slipping off. See that the sole is wide enough for ample comfort and a natural position of the foot. Full power cannot be employed if the joints are cramped. The sole will, of course, be stiff, and at the same time light. The rider must choose for himself the pattern of bars he will adopt. Toe-clips are also optional. He should take great care that he is quite safe in this direction; for, unlike the road rider, if he slips his pedal when going at full speed he may bring down a crowd of riders who are following, and be the cause of untold havoc and destruction to innocent men.

Great care should be exercised in training on the path. If passing a man who is only riding quietly, or appears to be slowing up, call out, "On your right!" When you are about to slow up yourself give a signal after the fashion of the London cabbies, by holding up the hand. Never dismount on the track, but ride off on to the centre. Never on any account slew across the track to the outside, so as to foul a man coming up at full speed close behind you. Most tracks have the inside made in such a way that a safety can be ridden off anywhere. All should be so constructed, for the scratch man will thus have a chance of escape when a bad spill happens in front, and leaves him no other course open. The outside must be railed off to keep the public from encroaching on the path. These rails should never be spiked. Some one is bound to run into them some day, and for this reason the top rail should be made rounded and smooth. The second row of spectators will keep the first from sitting on the rails, so there is no excuse for the setting of what is practically a death-trap.

If a man has plenty of leisure time, it is advisable for him to fix his trial spins at the same time that he will probably race ; that is, about three in the afternoon. The body, which in the case of a healthy man works with the regularity of clockwork, is best fitted for severe exertion at this hour of day. Of course, he will want much more exercise than is obtained by a short spell on the machine. This can be taken in many ways. Rowing is good, also running, and to a less extent walking. This latter exercise does not suit every one, and I should be chary of allowing too much of it to any rider under my care. Owing to the legs having to support the whole weight of the body during each step, the amount of exertion expended is considerable, and if too much work is done in this manner it will sometimes cause the leg muscles to lose a portion of their activity. With modern high gears this, perhaps, is not of so much account as formerly, when quick pedalling was everything. I advise as much hard work as the rider can stand without feeling absolutely exhausted. If he takes too much he will get thoroughly stale. Then nothing but absolute rest will put him right. When in this condition, a change to the seaside will benefit him greatly, and an extra glass of good port or champagne of an evening will be of positive service.

Constitution has much to do with keeping a man in condition, and, as I said before, each man requires a slightly different treatment. Some men can be treated like healthy bullocks and worked hard without danger, while others who may be of a highly nervous constitution are soon over-trained if similarly treated. Yet this latter class in good hands may produce a champion at short and medium distances. Strong men are mostly clumsy and prone to waste their power, and their trainers will have their work cut out in impressing upon their pupils the advantage to be gained from riding in good form. When a really strong man is found, who combines great physical advantages with skill and style, a most formidable opponent is produced. It is from such men that the world's champions are made. Swann, the 'Varsity rowing man, who possessed enormous strength and stature, took up the cycle, and before he had mastered the use of the machine entered in a scratch race with the best men of his day. He won, but "wobbled" so badly that the judges disqualified him, and he gave up the sport in disgust. Had he only deferred his initial attempt until he had gained greater proficiency he would undoubtedly have left his name enrolled in the list of those famous in cycling history. It was most unfortunate that the judges did not overlook this unintentional rolling, and so preserve a man who might have been a second Cortis or Zimmerman. From what most practical cyclists could see, he had the makings of a champion of champions.

In races much depends upon the judgment of the rider. The best man living may be beaten by an inferior opponent through failure in this respect.

It is an easy thing for a man to ride himself right out; but if he does this too soon, the final fifty yards, when he ought to smother the rest of the field, is too much for him. Personally, I can assure my readers that more than three-quarters of my cups—and I hold not a few—were won by using my head. Nature had not endowed me with a bountiful supply of muscular power, and I had to supplement this by every artifice I could muster. I learnt to sprint for a very short distance at a good pace; then by taking the greatest care of myself and reserving my effort until I was sure of being able to last till the post was passed, I managed to pull off many a race which seemed quite hopeless.

The novice will of course feel very nervous when he makes his *début* on the path, and he must not lose heart if he does nothing during his first few attempts. All our best men have been in the same plight, and not a few are the champions that I easily defeated in their early days. *Experientia docet*, and as the rider gets more used to the excitement of the track, so he will gain in coolness and judgment. Every one, I think, must feel a certain amount of excitement when he is awaiting the pistol's crack. Directly this is past and he is fairly on his way, he will have no other idea in his mind but how to win.

Many who may be hankering after the excitement of the racing track may wonder what it is to race in public before thousands of spectators. It may not be out of place if I give them a rough outline of one of my personal experiences. It was in the days of the Ordinary cycle, but the racing was as keen, if not keener, than at present. Imagine yourself, then, in my shoes at a country meeting during my racing career. There is a very rough grass track, with corners nearly square, and a stiff hill in the home straight. You arrive about the time the race is advertised to take place. A deputation of the local officials awaits you at the station, for they have been advised by wire that you are coming. The fact that you are a member of the L.A.C. and a successful racing man has caused you to be placed on scratch. You are driven down to the track by the president of the local club, and your advent hailed by cheers from the crowd. On adjourning to the dressing-tent you find that the other competitors have been kept waiting for you for nearly half an hour ; also, and this is somewhat of an unpleasant surprise, you discover that a fellow-clubman is present with a start of fifty yards. As you know that it is only a matter of a yard or two between you at best, you do not much relish your comparative positions. There is nothing gained by grumbling, so you take your mark with a certain amount of justifiable pride, for to be on scratch is always an honour—though sometimes a barren one.

Now you throw a hasty glance round the field, and notice the other competitors spread out on the course. The limit man, having nearly a lap start, is but a few yards behind you. The official in charge of the start comes up, verifies your position, and sees that your number corresponds with your place and name. After another wait of a minute or two, during which you have satisfied yourself that everything, from your shoe-laces to your machine, is in perfect order, the starter gives the word to "MOUNT." The man who is stationed to push you off has already placed your machine in what he thinks the most advantageous position, either on the inside or outside of the track according to the position of the other men and the shape of the course. Then follows the challenge from the starter—generally repeated twice—"ARE YOU READY?" and immediately afterwards the pistol cracks, and your attendant, aided by a vigorous thrust from your uppermost pedal, catapults you on your way. With a hissing sound, you skid the driving wheel for a few turns until momentum is given to the machine; then settling down to a pace which is just as much as you can maintain in view of the distance to be travelled, you are away and in full pursuit of the field. The nearest man on the twenty-five yards mark is your first object of attack, and having a better start, you manage to pick up most of this distance before he is well under weigh. Then drawing level with him, you drive him along for half a lap, using him to some extent as a pace-maker. By this time you come within distance of the next two competitors, and, passing the man you have been riding with, sprint up to them. One, evidently a better man than the other, takes you along at a rare pace for a lap, during which you manage to get in touch with your fellow-clubman, who you have all along picked out as your most dangerous opponent.

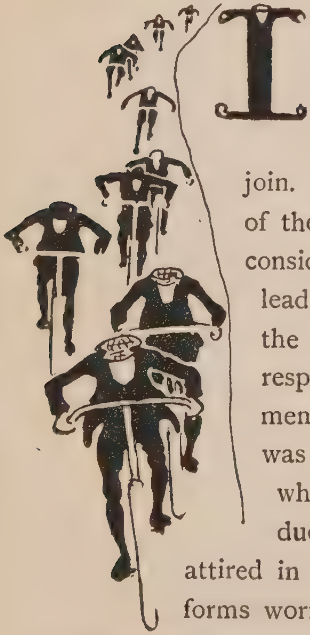
The wisest policy would be to follow him throughout, but being a handicap, and still a couple of long starters to be caught, you content yourself with taking up an equal position outside him. The increase of pace is soon evident from the fact that the distance men seem coming back to you. Will you catch them? is the question. You are perhaps by this time feeling a trifle pumped out, and during the next lap gain but little ground. Suddenly in the distance you hear the bell, feeble at first, but gaining in sound as you approach the mark. Last lap! Now or never your effort must be made. Bringing your head down a couple of inches lower, you strain every nerve. The man you have been riding with drops behind, and away you go in full cry after the remaining two. An occasional look out of the corner of your eye shows you that you are slowly picking them up, and, straining every muscle, you keep up the great pace down the back straight, and enter the bottom corner as they emerge into the home straight. Now you swing round that corner far closer than you have ever done before, for a bare three inches clear of your tyre is all you allow. The next time you look up you are within touch of your men, and although only another fifty yards is left, you feel victory is assured. Then to your horror you suddenly become aware that a wheel is creeping up outside you from the rear, and you recognize the hated colours of your rival clubman. It no longer rests between you and the limit men.

You have indeed a hard task before you. Taking advantage of your lead, he has followed easily after you, and is comparatively fresh. Do all you can, he still gains, inch by inch though it be. A terrific roar rises from the crowd, out of which you quickly recognize the bellowing of your attendant urging you to further efforts. Then only a yard or two away you have a dim vision of the judges, with the tape across the track and heads down to watch the exciting finish. Your enemy is dead level, and with a few final frantic efforts you rush past the post, uncertain what the verdict will be. You pull up dead beat, your man rushes forward and catches your machine for you to dismount. The officials are grouped round the judges, and you know that they are discussing the vital question. Then the groundman walks leisurely to the telegraph-board. Why won't he hurry? Then at last the numbers rise, and before you hardly realize what has happened, your friends are around you enthusiastically cheering. You have won a race that is worth winning, for your foemen were "worthy of your steel."

All cycling contests are now held under the laws of the National Cyclist Union, and before any one can compete it is necessary for him to obtain a licence. The novice must be very careful not to compete at any small country meeting which has not first obtained a permit to be held and which is not publicly announced as being held under their laws. Should he do so he will find himself suspended from amateur racing. What is more, the removal of this disqualification is a tardy process, and one that will cause him much trouble. Licences cost half a crown, and as the officials of the Union are not noted for celerity in dealing with their business, plenty of time should be given them, and an application sent in early in the year. A *bona-fide* amateur will have no difficulty in answering the numerous questions in the application form; but those in any way connected with the trade will discover the task of satisfying the governing powers somewhat difficult. Until it can be clearly proved that the applicant is in a position to pay his own expenses, he will find that his permit is not readily forthcoming.

CHAPTER XII.

ON CLUBS, CYCLING INSTITUTIONS, AND LITERATURE DEVOTED TO THE SPORT.



IN the early days of the wheel the club was a regular institution, which every rider felt bound to join. In fact, to be a member of the "Great Unattached" was considered almost a disgrace, leading others to assume that the rider was not of sufficient respectability to become a club member. The club uniform was as it were a masonic sign, which acted as an introduction on the road. A rider attired in one of the well-known uniforms worn by the Stanley, London, or Pickwick Clubs was considered a desirable acquaintance when met on a touring expedition. The early days of cycling were, to my way of thinking, far more pleasant and sociable than those in which we live now. Owing to the scarcity of riders every one felt bound by a common bond to assist a brother cyclist in distress for the common good of the sport. Many a score of pleasant evenings have I spent in the company of perfect strangers, whom I have joined on my wanderings, and whose sole introduction was a recognized club uniform. *Nous avons changé tout cela!* and the club uniform is no more. Worse still, nearly all the old clubs are dead. Where is the Pickwick, the father of clubs; the Clarence, to whom Wat Britten belonged in the days of his famous record to Bath and back; and the Druids? All dead or practically defunct. A few of the old clubs still exist. Of these the London is an example; but as a rule ninety-nine out of every hundred of those who once attended on Hampton Court Green are no more, and their members scattered over the wide world. What a wonderful thing we used to think this great annual meet! How our club captains used to strive to bring every and all of our members to the great muster! The function was originally started as a sort of demonstration to show the outside public that cyclists—or, as we were then called, bicyclists—were more numerous and powerful than our opponents would have men believe. Union was strength, and in the palmy days of Mr. Paget, the anti-cycling magistrate at the Hammersmith Police-court, every effort had to be made to prevent the devotees of the wheel being unfairly treated and the sport killed by vexatious regulations.

The early clubs, in their anxiety to make an impression, went to extremes as regards club uniforms, and those adopted by some savoured more of the costumes worn by a German band than by respectable Englishmen bent on enjoying themselves. Tunics adorned with gold braid, jockey caps, and silver bugles pendant from the back with coloured silk cord, were often to be encountered. The club badge was worn in a conspicuous position, and assumed the shape of a large monogram or silver shield. Now clubmen dress in a sensible costume, and, as far as I know, no modern clubs make any hard and fast regulation regarding uniform. They have, of course, some mention of it in their rules, but it is honoured more in the breach than the observance. Club badges have been transformed from large and massive affairs to a tiny stud worn in the button-hole. Club runs are almost extinct, and when fixed are only attended by a few. The active clubs still existing in the Metropolis may be almost counted on the fingers of the two hands. The best known are the Catford, the Ripley Road, the North Road, and the old London, which still flourish. The second is probably one of the most select, and musters in its ranks many old cyclists, who had great racing reputations in the amateur days. Major Liles, ex-amateur champion, is the captain, and among the other well-known members may be mentioned Dr. E. B. Turner, the ex-tricycle champion and well-known medical expert as regards all cycling matters. Mr. H. J. Swindley, the London editor of the *Cyclist*, is also a very prominent member. The club badge is a small yellow button, and the head-quarters are the Anchor, at Ripley.

The largest and most successful of all cycling clubs is the C.T.C., or Cyclists' Touring Club. This institution was founded at the end of 1878 by Mr. Stanley Cotterel, and after many vicissitudes has grown under the management of Mr. Ernest Shipton to its present position. All riders at some time or other derive benefit from the past work of this our largest club. Every time they take a machine by rail they have to thank the C.T.C. for the present tariff, which is about one-third of the fare charged before the efforts of Mr. Shipton and his colleagues succeeded in obtaining a reduction. The three venerable lines extending in our south-eastern district—the Brighton, the South-Eastern, and the Chatham and Dover—are exceptions to this rule. Their opposition to cycling is, however, no matter for surprise. Their rate of speed, though possibly equalling if not surpassing that of the pedestrian, compares most unfavourably with that of the cyclist. Their jealousy has been aroused, and their present attitude is a natural consequence. In the early days the benefits derived from the C.T.C. hotel tariffs were of value; but now that the great army of cyclists has been let loose on our highways, hotel proprietors have seen the wisdom of catering for them specially, and have discovered that overcharges, combined with inefficient attention, bring their own reward in the shape of diminished custom. For this reason the benefits of the tariff are now considerably reduced, and as a general rule the traveller can put up when and where he pleases and make sure of having his proper share of attention.

Among other good things in which riders who belong to the C.T.C. participate may be mentioned the excellent series of road-books published by the club, and the danger-boards established in combination with the N.C.U. at the top of steep declines on the main roads. Although some of these boards may be superfluous, they are of great service, and many a rider has to thank their timely warning for saving him from a bad spill, with perhaps fatal consequences. I well remember a most inviting descent, when after some miles of uphill work, I put up my feet for a nice coast. Luckily for me, at that moment the conspicuous warning caught my eye, and, having no break on my machine, I resumed the pedals, and got the bicycle under control. Not one minute too soon, for as I rounded the next turn the ground seemed to fall away beneath my feet and the tops of tall trees growing only a little further down the road were on a level with my head. Concluding that such a place was not even fit to negotiate slowly, I hastily dismounted, and with difficulty walked my machine down among gullies and ruts worn by the rains. The apparently gentle descent was almost a precipice, with zigzag turns in it, none of which could have been by any possibility steered by a runaway rider. In such moments as these the rider realizes what he owes to men who by their foresight and energy have saved him from a bad accident.

Foreign tourists, and in fact every one who contemplates using the cycle as a means of travel, should join this club. Its monthly journal is of especial value, as it is free from the puffs and laudations to be found in some cycling literature, praising up the wares of an advertiser regardless of merit, simply because he pays a good round sum for the space he occupies. The opinions to be found in the columns of the *C.T.C. Gazette*, although often the long-winded notions of faddists, have the merit of being absolutely genuine, and are free and disinterested opinions of the machines and appliances criticized. The subscription to the C.T.C. is *3s. 6d.* per annum, with an entrance fee of 1*s.* The head-quarters of the club are situated at 47, Victoria Street, Westminster, a line to which address will bring the candidate the prospectus and a form of application. Its present membership is over 35,000.

The other great cycling institution is the National Cyclists' Union. This body, which comprises delegates from all clubs and unattached cyclists affiliated to it, takes upon itself the government of all racing matters, the establishment of the championships, and the scrutiny of claims for record performances. It holds practically the power of life or death over the career of the amateur racing man. Its suspension is so formidable that once under its ban he finds himself excluded from all amateur contests. The only course open to him is professionalism, and even there the Union is now exercising some control in causing the riders who wish to race at meetings held under Union laws to be licensed. In fact, the N.C.U. is the Jockey Club of cycling, and considering that its members are not paid, but work only as honorary officials, it does its duty thoroughly well. It shares the expense of the danger-boards on hills with the C.T.C. Occasionally it makes its presence felt in Parliament through cycling M.P.'s, and sometimes briefs counsel to defend a rider who is upholding the rights of the cycling body. It is a *bête noir* to those who molest cyclists who are described by the just title of "road hogs." Many have experienced what it means to have the weight and power of the N.C.U. to contend with. Racing men have to thank the Union for the guarantee that it demands of the value of racing prizes. In the old times these used to be advertised at considerably above their true value, and to such extent did the evil grow, that I had personal knowledge of a medal given in a race, the value of which was subsequently calculated to be twopence. Many ten-guinea prizes were only worth three or four at the most. At the present time if a rider wins a prize which he does not think worth the sum represented in the advertisements of the contest, the Union will order its value to be ascertained, and if it is found that it has been over-estimated the difference in value has to be made up, or the promoters of the meeting are sued in the courts.

The cyclist cannot complain that he is ill-supplied with literature. Cycling has not only its own journals, but extensive notice is taken of the pastime in all the daily and weekly papers. Society journals, whose early efforts were devoted to abuse and depreciation, now patronize it. From calling cyclists by the unpleasant epithet of "Cads on Castors," they now vie with one another in lauding it to the skies and publish sketches of well-known celebrities in cycling attire. This may be an inducement to some young people of both sexes to join in the pleasures to be obtained by becoming cyclists; but the whim of fashion is perfectly worthless in conferring any permanent benefit on the sport itself. The writers are generally quite ignorant of the subject on which they dilate, and are perfectly ready to swallow any trash with which the first depôt manager or plausible salesman may gull them. The riders of whom they write are equally ignorant of cycling matters. The experience they have had is usually confined to some few months of gentle riding in Battersea Park or other show place for fashionable wheelmen and wheelwomen. I hope that the technical details which I have given in the present volume may be of some use to them. Although they talk learnedly of construction and tyres, a little real knowledge ought not to be disdained. They want it badly.

The early days of cycling literature date back to the seventies, and the *Bicycling News* was established about 1876. This paper, which now flourishes, was the earliest successful journal devoted to cycling matters, and its back numbers are now interesting as affording evidence of the struggles and vicissitudes of early bicycling life. It was founded by Mr. Benjamin Clegg, and its earliest Editor, Mr. James Inwards ("Ixion"), made it the cycling paper of its time. Its columns were especially interesting owing to the voluntary correspondence from many able writers on subjects which touched all and every grievance of the bicyclist of the day. "McCullum Hill," Freeth, George Dominy, McCandlish, Swindley, Sturmey, and others too numerous to mention, freely contributed their ideas and experiences, from which manufacturers gained valuable hints. If a cycle was produced and found wanting it was speedily condemned, and its faults shown up by exasperated purchasers. Now a firm who only take good care to advertise largely may go on selling until lack of customers brings extermination. Editors naturally have to be chary of inserting criticisms from correspondents whose *bona fides* they have no proof of, and such hosts of novelties are annually brought out, that it is not possible for the members of the staff on a paper to personally test them all. Moreover, the law of libel appears to be more stringent than of old, so that honest criticism is curtailed.

The next important publication which followed after the *Bicycling News* was the *Cyclist*, which was brought out by Mr. Henry Sturmey, who is still the editor. This gentleman had already won fame as the author of a very comprehensive work entitled "The Bicyclist's Handbook." The *Cyclist* for a time ran the older publication very close, and finally surpassed it. It still flourishes, and is now recognized as the trade organ. After a few years of uncontested supremacy, younger and more pushing journals arose, of which *Wheeling*, *Cycling*, and the *Cycle Record* may be mentioned. The former was always more or less a Metropolitan paper, and its columns have been admitted as authoritative on all matters connected with racing. *Cycling* and the *Cycle Record* are more modern productions, but the former has by skill and enterprise in the way of costly illustrations gradually attained the largest circulation ever reached in the history of cycling literature. There are other papers and periodicals connected with the sport, as, for instance, the *Cycle* (so admirably conducted by Mr. Charles Sisley), the *Athletic News*, the *Scottish Cyclist*, and the *Hub*, a new venture produced by the proprietor of *Tit Bits*. This latter is interesting to those who prefer light reading. It does not appear to be thoroughly in touch with either the authorities who govern the sport or with racing men. However, its illustrations and articles are amusing, and amongst the ordinary cyclists, who do not care in the least what may happen in cycling politics, it will find many readers.

CHAPTER XIII.

ON TANDEMS, MULTICYCLES, MACHINES OF PECULIAR DESIGN, AND MOTOR-CYCLES.

THE theoretical advantages of being able to man a machine with a numbers of riders are great. On this account inventors have laboured from the early days of cycling history to produce a machine to which they could apply their theories. Until quite recently these efforts had not met with much success; and even now it is an open question if the single machine is not fully equal to any multicycle on a "give and take" course.

On multicycles.

The multicycle, as I have mentioned, has, in theory, an advantage over the single. This is owing to the fact that it can be built lighter than a proportionate number of single machines. The number of running bearings are fewer, and the windage—the greatest of handicaps to riders—is very much reduced. In spite of this, however, the multicycle does not carry out inventors' hopes in actual practice. This is to be accounted for by the fact that the mechanical difficulties of building a machine for a number of riders are numerous. The length of the frame not only increases the binding action on the bearings and chain, but causes it to more readily get out of line. The effect of anything being out of "truth" in a cycle makes an enormous difference to its running powers. Further, pneumatic tyres do not appear to be of so much benefit when heavily loaded as when run under a moderate weight; the reason being that the walls and air chambers necessary to withstand the increased pressure require to be of so much stouter material that a large amount of resiliency is lost. Yet again, it is not possible to get two or more men to ride at the highest speed in perfect union, or as it is termed in cycling language, to "nick together."

Tandems. The earliest tandem machine was the Coventry Rotatory tricycle, in which the two riders sat back to back. Then followed the Sociable tricycle, which was introduced by Starley. This was simply an ordinary wide tricycle, in which the two riders were seated alongside each other, and drove a double crank. In the earliest machines the driving was independent, and each rider drove the wheel next to him. This being found a mistake, the balance gear was applied, and improvement followed. A great advance was made when the Humber tandem tricycle appeared on the scene. This machine was simply an addition to the celebrated single machine made by the firm, and at once proved its superiority over anything hitherto made on the same lines. Between it and the Olympia tandem, made by Marriott and Cooper, popular taste was divided, and these two machines may be said to have been the only really successful tandem tricycles. Many other firms had specialities, but they met with but scant support.

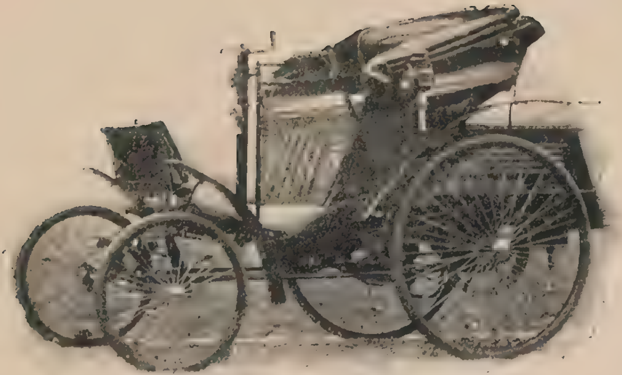
The idea of a tandem bicycle dates back to about 1880. To Mr. M. D. Rucker, the present manager of Humber and Co., is due the credit of originating it. His invention was made at the time when the Ordinary was the machine used, and he chose that type for his base of operations. It consisted, in fact, of two Ordinary bicycle wheels, connected by a long bar, and dispensed with the backbones and rear wheels. This peculiar machine had only the merit of novelty to recommend it, and as its use was attended with many disadvantages, owing to each rider having control of one wheel, it soon died a natural death. Until after the Safety had ousted the Ordinary in popular favour, nothing further was attempted on similar lines. Then manufacturers, headed by Dan Albone, the maker of the "Ivel," on which Mills did his celebrated record of 295½ miles in twenty-four hours, brought out machines closely approaching the lines of the modern tandem. During the days of solid tyres these were only partial successes; and it was the introduction of the pneumatic-tyred machine for pacing purposes that raised the multicycle to its present popular position.

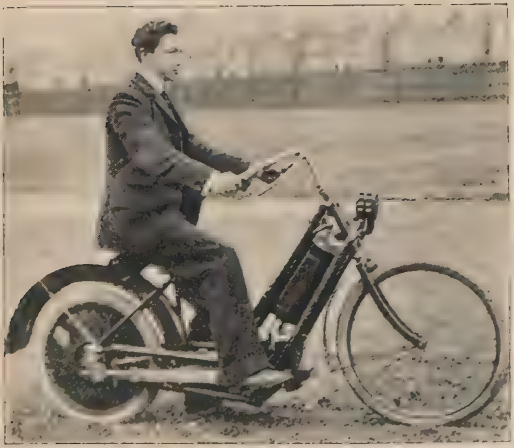
Many different forms of tandems have been introduced, and, in accordance with the law of the survival of the fittest, have disappeared in favour of the present pattern, in which the riders sit between the wheels, and drive directly on the back wheel, through the medium of sprocket wheels and chain gearing. Triplets and quads are now almost all made on this design, the only difference being in the form of the frame, which has taken every possible shape that could be constructed, including a series of tubes arranged in triangles and other geometrical figures. Tandems have been made with both dropped and Ordinary high frames, with independent and with connected steering. With the latter, each rider had his or her share in the guidance of the machine. Even now, with all our boasted progress in cycling engineering, makers and experts differ as to which is correct. My idea on the subject is that the foremost rider should have sole control of the steering. When the machine is made to carry a lady as one of the crew, the position for her seat should be in the rear, where she will be more out of the way of danger, and leave the task of guiding the machine and controlling the brake entirely to her male companion. The most scientifically constructed machine embodying these improvements is undoubtedly that made by the Raleigh company.

A tandem of this class offers many advantages as a road machine for genuine touring, and allows a pair of unequally-matched riders to make better progress than they could separately accomplish.

One of the best features of a tandem is that the resistance caused by a head wind is not so much felt as in a safety; and as a lady always suffers from this to a greater extent than a man, she will experience increased pleasure in being able to slip along at a steady pace, without delaying her companion. On this account I am certain that in future the tandem will become exceedingly popular among those riders who are not selfishly inclined, and do not wish to always indulge in the doubtful pleasures of taking trips *en garçon*. Cycling husbands can no longer make the worn-out excuse that their wives are not able to keep up with them on cycling tours.

When choosing a tandem for touring work, it should be borne in mind that the question of rigidity is of vital importance, and on this, coupled with the quality of the workmanship, depends the freedom with which the machine will run. By placing one foot on the foremost pedal and exerting a heavy pressure, it is possible to see how the machine stands the strain. If really rigid no perceptible "give" should be noticed. The machine may roll a bit on the tyres, but the frame itself should not spring to any appreciable extent. If it does so with only one pedal under pressure, the buyer may be sure that when it has to withstand the amount of torsion caused by two riders acting in perfect union it will "give" badly, and turn out an indifferent hill climber. It is better to put up with ten or a dozen extra pounds of weight than have a machine too lightly built. Not that weight is a guide as to rigidity, for it not infrequently occurs that a heavy machine is less rigid than one of far lighter build. It depends upon the skill of the designer, who, of course, cannot build a machine of exceptional strength without increasing the weight, although the converse is only too easy. Hence a machine should be chosen in which skill in design is embodied in every detail. These can only be obtained from firms which have studied the question, and gained experience in the practical work of building machines of the class. Tandems and multicycles by makers inexperienced in the art of their construction are better left alone, although such makers may be unsurpassed at the ordinary cycle work.





A Motor Car and a Motor Cycle.

Quads and triplets.

These remarks apply equally to quads and triplets, which require more care and attention than even tandems. But as they are at present only used for pacing purposes the ordinary cyclist will have but little interest in them. In the future we may expect to see family machines, built with a sloping framework, enabling the head of the family to take the premier position, and his wife and children to be accommodated according to size and number. But "sufficient for the day is the evil thereof," and until such a domestic climax arrives I prefer to leave the question undiscussed.

The Bantam.

Among single machines are several unusual patterns which have not been previously mentioned in these pages, but of these there are at present only two which will require any special notice. The first is the latter-day development of the geared Ordinary known as the "Bantam." This machine is simply a very small pattern of its prototype, and is often made with as small as twenty-two and twenty-inch wheels. The rider sits between the wheels on a spring carried by the backbone, as in the old Ordinary, and drives and steers the front wheel direct. The requisite gearing to enable the rider to pedal at a comparatively slow pace is an adaptation of the celebrated "Crypto gear," on which Shorland once broke the record, and for a time threatened the existence of the rear driver. This little machine is a perfect success, and is strongly supported by many riders, generally elderly men. It is wonderfully compact and light, easily mounted, and possesses very fair speed. On a good track I doubt if it would be found much behind the rear driver; but for ordinary road work, where the rough has to be taken with the smooth, it is a trifle slower, say, a mile an hour. However, it is somewhat a matter of guesswork to estimate its full capacity. It is splendidly built, and perfect in every detail. The inventor is a most practical man, and anxious to benefit by all modern improvements; in fact, everything which experience has shown to be reliable is found embodied in its construction. The Crypto company, Clerkenwell, are the makers.

The sliding-seat.

The only other specimen, out of the common, which is worthy of notice is the "sliding-seat" bicycle invented by Mr. Bryne. This is after the pattern of the rear driver, and its peculiarity consists in the manner in which the seat pillar is carried. The diagonal tube is hinged at the bracket, and the usual backstays are absent. In their place the main framework of the machine is carried direct from the steering socket to the back wheel spindle, and is like a cross frame made up from four tubes with cross braces in the middle. From the top of the socket a stay is hinged to the saddle lug, and by this means it is possible to shift the position of the saddle without increasing or diminishing the relative distance between the saddle and pedals. The rider can assume a position directly over the centre of the crank axle or some foot or so behind it as he finds the more advantageous. I have never ridden the machine myself, and opinions of others vary as to its merits; one rider describes it as a sensation similar to the end of a plank see-saw, while others who have tested it more fully say that when once the action is mastered real benefit is to be derived from the invention. I have been promised an extended trial of this machine, and until then I do not care to venture an opinion on it.

Motor-cycles.

Motor-cycles are at present in their infancy in this country, and until the repeal of the Road Locomotive Act could not be tested at speed on the highway. The advantages of the motor-cycle are at the best very doubtful. The vehicle will be a sort of cross between a motor-car and the ordinary cycle, and will be, in my opinion, a poor substitute for either. If any one wants to travel at their ease without exertion the motor-car would be preferable; and when out for exercise the motor would be found only an encumbrance, and could be best dispensed with altogether. As now made, the motor weighs considerably more than the machine, and, to my mind, what is really wanted is a very light motor, weighing, say, not more than a dozen pounds, and of sufficient power to just propel the machine, so that the rider could make use of it as an aid only. He would then be able to use it when running against the wind and up inclines, and with the assistance of the pedals maintain a good pace.

For the present only three sources of motive power are available, and these are steam, oil, and electricity. Until some lighter substance than lead is discovered for the plates of secondary batteries the latter power is useless for practical purposes. Primary cells are not of sufficient power; further, they are too expensive to maintain and too messy to keep in order. Steam is at present most unpopular, but will, I fancy, in time be found the most compact and powerful of the three in the hands of a man understanding its management. On account of the dangers attending the use of a tubular boiler worked at very high pressure, and the constant attention it requires, it has never been used to any great extent. At the Stanley Show of 1895 one firm had a very primitive contrivance, with a small boiler carried in front of the head of the machine and a piston working on the front wheel. The idea was, however, poor, and the construction lacked ingenuity, so that steam has never to my knowledge advanced further than the mere experimental stage. It would be an easy matter for any capable engineer to design a compact engine able to drive a cycle at a good pace. The great difficulty attached to the solution of the problem is the constant attention which a boiler requires. The firing, again, must be so maintained as to keep up a constant head of steam in accordance with the requirements of the engine, varying with the work to be done. The water-level in the boiler must be kept constant; if too full it will "prime," and cause waste and eventual stopping of the engine, while if allowed to get too low, danger of explosion is probable. When my readers remember the fact that the average cyclist has all his attention taken up in avoiding obstructions on the road and otherwise attending to the steering, they will see that he has but little opportunity of keeping an eye on these necessary details. Further, having both hands occupied, he cannot always be ready to turn on taps at the right time. Thus for the single machine steam must be at present put on one side. For multicycles, however, I would be prepared to back it against any other motive power yet discovered. The earliest application of steam to cycles was made about 1881 by Sir F. Perkins, who showed a steam tricycle at the Stanley Show, held that year in the Holborn Town Hall. This gentleman was afterwards fined at the Greenwich Police-court for using the vehicle on the highway without the regulation man with the red flag.

Oil is the only method of driving a motor for any length of time without giving the machinery constant attention. By this means the successful motor-cycles have so far been propelled. The home of the motor-cycle is probably Germany, although in France they have made a greater sensation. The design is varied according to the fancies of the makers. I have so far only seen a few, and these have all been driven in the same manner. A pair of cylinders have been attached to the compression stays, with the cover plates just level with the crank bracket. The pistons, made on the usual trunk pattern adopted in all oil and gas engines, have had their connecting-rods coupled direct to cranks on the rear wheel axle. The latest I have seen in use had the oil carried in a reservoir in front of the steering post, and the water for cooling the cylinders in a tank made in the form of a mud-guard over the rear wheel. The engine was of the usual Otto-cycle type, and had electrical ignition. As the rider only spoke German—a language of which I am profoundly ignorant—I was unable to find out the secrets of the vaporization of the oil, and presume that a portion of the cylinder had first to be heated by some artificial means. The machine was very heavy, and I was the only one of the party who could lift it clear of the ground. I estimated the weight at about two hundredweight, which in a cycle appears enormous. The regulation of the speed was made by a needle-valve, worked from a conical regulator on the right handle. This contrivance enabled the rider to shut off all further supply of oil and so stop the engine, or by a simple movement of the thumb to allow it to go on ahead at the original pace, which could be altered by unscrewing a thumb nut.

As the principle of the oil motor is not generally understood, a very short outline of the manner in which it works will be of interest. An oil-engine is really a gas-engine which produces gas as required by the vaporization of oil. The oil is drawn into a closed vessel by means of an inspirator, and while there is brought into contact with the already heated sides of a metal vessel called the vaporizer. This at once decomposes it into gas in the same way as water would be turned into steam. The gas is drawn into the cylinder and mixed with a proportion of air, generally at the rate of about one part of oil gas to fourteen of air. When the cylinder has taken in a full charge of the mixture on its outward stroke, it returns and compresses it to about one-fifth of its original volume. These movements require one complete outward and inward stroke to accomplish, during which time the engine is doing no work with the cylinder engaged.

When the return stroke, during which the mixture has been compressed, has been accomplished and the crank is just about its dead point, the compressed mixture is fired, either by means of an ignition tube, or by an electrical spark. The instant this occurs a small modified explosion takes place in the cylinder, and the pressure at once rises to some one hundred and forty pounds or so, giving an impulse to the flywheel of the engine sufficient to carry it over the next revolution, and allow sufficient surplus power to do the work. After the mixture has been fired, the exhaust port of the cylinder opens on the return stroke, and allows the products of the explosion to be swept out into the air by the returning piston. Then, as the engine makes its next stroke in an outward direction, a fresh charge is drawn into the cylinder, and the process repeated. This is called the "Otto Cycle," and, as it has been explained, for every single cylinder employed but one impulse is obtained in every two revolutions. The great length of time required between each impulse in an oil-engine necessitates either the use of a heavy flywheel, or else (as is the case in motors for cycles) the use of an extra cylinder.

In the "Dailmar" motor-engine, now largely used for autor-car and cycle work, the forward end of the cylinder is made use of, and a portion of the charge is compressed by its means into a closed vessel in which the cranks work. This enables a larger amount of compression to be gained, and at the same time the rush of the compressed mixture helps to sweep away the remnant of the burnt gas from the rear of the cylinder when it is admitted. In an ordinary oil or gas engine a space has to be left at the rear of the piston stroke, in which the mixture can be compressed, and in this, after the explosion, a certain amount of the burnt product lingers to the detriment of the next explosion. This product has no vitality left, and its presence prevents the space it occupies being taken by the fresh charge.

The main objection to the oil-engine is that it takes trouble to start. This can only be done by revolving the engine several times by hand after heating the vaporizer. When once started it is best to allow it to run even when the car is stationary, a difficulty surmounted by throwing the engine out of gear with the propelling mechanism by means of a contrivance called a clutch. Oil and gas engines cannot be reversed, so that further mechanism is necessary if this movement is required. When pressed hard they can at their utmost give an impulse every other revolution, and every diminution of speed decreases the number of impulses per minute, so that when overloaded they do not by any means give out as much power as they would under their proper load. With a steam-engine when the load is increased and the engine forced, the full boiler pressure can, if desired, be put into the cylinders, and, like a strong man, the engine rises to the occasion, often giving out three or more times the power it is supposed to develop. The oil-engine, on the contrary, is like a turbine ; not one ounce over and above its maximum can be coaxed out of it. If much overloaded, its efforts, like those of a stubborn mule, will die away.

As the power developed from all oil motors is derived from a series of explosions, it follows that a shock is communicated to the engine every time an impulse is obtained. This is transmitted to the vehicle, and as some of these small motors run several hundred revolutions per minute, the vibration is most unpleasant. It is a moot point if this fault will ever be conquered by any form of oil-engine with cylinders and pistons. When a rotary motor is invented it may solve the problem. I have been at work on one for some time, and the idea is perfect in theory; but in practice many mechanical difficulties present themselves, so that I am by no means sanguine of success. If only some cheap means of obtaining electricity could be discovered, doing away with the heavy accumulators, it would be the exact power required for the work. The electric motor is silent, light, reversible, and rotary in action, giving no vibration. When once a means is found of obtaining the current conveniently, motor-cycles will become within reach of the practical rider.

I will add a few words, before I close this chapter, on the memorable ride to Brighton. The public then had an insight into the practical working of both motor-cars and mechanically-propelled cycles, under circumstances which can only be described as most unfair to the new vehicles. The weather was as bad as English weather can be, and as the bulk of the machines were more or less in the experimental stage, it was no matter for surprise that breakdowns were common. The run, which was announced as a mere trial and of the processional order, soon developed into a race pure and simple. Before Brixton Hill had been passed, the occupants of some of the lighter machines took every advantage of a momentary clearing in the vast crowd of sightseers to put on the pace, and by Streatham attendant cyclists found that they were no match for their new rivals of the road, who, perfectly regardless of the legal limit of twelve miles an hour, rushed down the slopes at top speed, with motors going full power, and toiled up them faster than most wheelmen could follow. The leading machine thus traversed the fifty odd miles between London and Brighton in about two hours and a half, although great loss of time was incurred in getting clear of the crowds at the starting-point.

If this could be accomplished under such trying circumstances as on the opening day, it is easy to foresee that, given a good road and fair going, it should not be a difficult task to build a racing motor-cycle capable of beating the level sixty seconds for the mile—the only doubtful point being, Is it possible for the driver to keep his course at such a speed? The slightest swerve in the steering would be sufficient to cause a catastrophe only equalled by a railway accident. Up to the present the authorities appear to wink at any breach of the law as regards the pace limit; but it will not be long before motor-cars come under the same ban as "scorching" cyclists, and then their drivers will find that the guardians of law and order have a wonderful knack of estimating speeds at about three times what they really are. Such exaggerated ideas are, by the way, invariably accepted by the magistrates as correct, and fines doled out accordingly. Whether the police will find it as easy a task to stop a furiously-driven motor as to upset a cyclist is a point which will require practical demonstration. Personally I should think they would be in a similar position to the historic "Coo" of the great Stephenson.

The later patterns of motor-cycles, as distinguished from the larger conveyances, are mostly oil-driven, with electrical ignition, and so far the "Bollée" has the greatest reputation, although the "Kane Pennington" appears to run close on the heels of its rival. The favourite form for these machines is a tandem tricycle of the pattern known as the "Olympia," with driving wheel behind, and two steering wheels. The motor drives the rear wheel with cogged gearing and a flywheel. The machine is steered by the leading rider with a hand wheel and rack and pinion motion, while the pace is controlled by the second rider with a lever on the left hand of the machine, which both throws the motor out of gear, and with the same movement applies a powerful band brake sufficient to pull up the machine in a few yards. The cylinder in these machines has not a water jacket, but a series of thin rings around it which serve the purpose of radiating some of the heat. Benzoline is frequently employed for fuel, as it is far more volatile than the heavy oils.

CHAPTER XIV.

HOW TO BUILD A BICYCLE.

BEFORE going into the question of cycle construction for amateurs, I have to warn my readers that unless they have had experience in the use of tools, and have some knowledge of working in metals, they had better content themselves with ready-made machines, and entrust their repairs to a competent man. It will be cheaper in the end, and perhaps save the blame of a broken limb being laid at my door. A bicycle is no longer a difficult thing for an amateur mechanic to construct; but it is advisable for its maker to have learnt the rudiments of the craft in other branches of engineering work, where the results of a failure would not have the same disastrous effect as would ensue if a machine failed at a vital point, such as the fork-crown. Nowadays the small maker and amateur can easily procure all the parts, requiring the use of expensive machine tools and power to drive them, at a cheaper rate than they could be made in the ordinary way.

Even the largest firms find it economical to buy a certain proportion of the materials used in a cycle; thus the amateur need have no scruples in buying those parts of the machine, the making of which presents more than ordinary difficulties without special tools. Of course, if it is desired, nearly the whole of a machine can be made and completed with ordinary engineers' tools, and that, too, in first-class style; but it will not be an economical proceeding, unless a labour of love, as all such work should be to the genuine amateur. Moreover, a large amount of leisure time will be wanted;

many little parts, costing only a penny or two to buy, being extremely difficult to make properly by hand, often entailing the construction of several special tools, which, after serving their purpose, are no longer of any use.

Tools required.

The actual tools required for amateur cycle-making are, firstly, a good vice and an assortment of files; secondly, the means of obtaining the necessary heat for brazing up the joints. This work, by preference, should be performed by a large gas blow-pipe, blown by a foot-bellows, although a charcoal fire in a small forge will do, *with great care and no small amount of skill.* Thirdly, a variety of tools, including tackle for drilling holes, an assortment of screw-plates, stock and dies, taps, drills, and, lastly, the lathe, are absolutely necessary. The latter is the most useful tool which can be found in any workshop; and when once its many powers have been discovered, no mechanic will be willingly without it. The work in making a modern machine is all of a light character, and so long as the lathe chosen has a good stiff slide-rest and a heavy flywheel, it will be sufficiently powerful to make any part of a bicycle. Using one of the Britannia company's 3½-inch centre lathes, I have, in my amateur days, done all and every piece of turning and boring in a machine. The lathe I recommend for the work is one of five-inch centre, with gap-bed and screw-cutting gear. This, with a small milling appliance, will be quite sufficient, and enable the amateur to make his own hubs and machine out the lugs and crank-bracket. It gives a genuine amateur immense satisfaction to be able to do all these things for himself; and he will have the advantage of being able to choose the design he fancies, both as regards the set of the frame and the size of the tubing employed. If he has to buy such parts as the lugs, crank-bracket, hubs, etc., he will perforce have to follow the design for which they were made.

To give a full and complete description of the means and methods necessary for building a complete machine is beyond the space permissible in this work. Those who have the means and the skill will, by the exercise of their own ingenuity, be able to sketch these parts out for themselves. I shall only be able to give details, as to the construction of a machine from a set of parts, which can readily be bought from various dealers whose names I will supply to any one who finds it difficult to obtain them.

Component parts.

These parts comprise the head, with ball races, the saddle-lug, the crank-bracket, fitted with cones, axle, and chain-wheel, cranks and pedals, the hubs, and sometimes the ends for the back-stays and compression-stays. When I built my first machine, many years ago, such luxuries as sets of components were not to be obtained. I had to do nearly everything excepting the bending of the rims. When a crank, Stanley head, backbone, or forks were wanted, the forge and a bar of iron had to supply them. If a handy piece of good gas-pipe was procurable, it was pressed into service for the backbone. The rest was solid iron. Mild steel was then an unknown quantity, so far as I was concerned; wrought iron being considered good enough when pounds for inches was the rule. But with the present system we can make just as much or as little of the machine as we like.

The choice of a set of components depends upon the purse of the would-be mechanic. They vary in price cent. per cent. On the principle of "what is worth doing is worth doing well," I shall presume that my readers have bought one of the well-known sets made by Messrs. Edie, of Redditch; and this includes all and everything necessary for the machine save the tubes, saddle, handles, rims, tyres, spokes, and nipples.

The type of machine I should recommend to the ordinary rider is a strong roadster calculated to carry its rider safely for some fifty thousand miles. Its weight, "all on," with brake, saddle, and pedals, with full-sized roadster tyres, should be well under the thirty pounds. By cutting down the rims and tyres, the weight could be easily reduced to twenty-five pounds, excluding the brake and including a lighter saddle.

Tubes.

On receiving the set of parts the first thing to do is to cut the tubes to the full length. It is better, when buying, to have them cut an inch longer than you need them, as the men employed in stores where they are sold are not very nice in their measurements, and reckon on the customer doing the fine work himself. Put the machine roughly together on the floor, with forks, lugs, and bracket on their side, with tubes placed in the position they will occupy. If a good fit, the tubes will not then go into their sockets, but can be easily placed over them and held in position by any rough blocking to hand. From this the

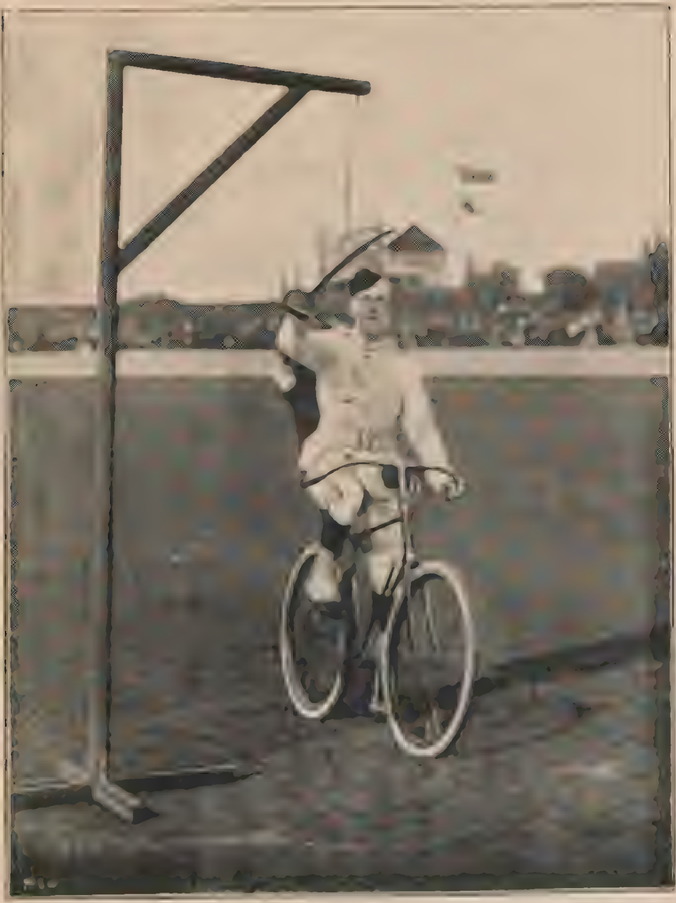
Designs.

angles can be ascertained, the machine designed, and a sketch made of it, either on the floor with chalk, or, better still, in ink, on a large piece of brown paper. When a machine with all its parts is being made, it is absolutely necessary, as the very preliminary, to make a full-size drawing, not only of the frame, but also of each and every part, with the angles and dimensions marked on them, and with a section and plan of the hubs and crank-bracket. Without a good drawing, which must be rigidly adhered to, the maker will soon find himself in some dilemma. Of course, when the parts are bought, it is only necessary to follow the design of the frame as intended by the makers of the components, and so long as the length of the tubes is known, it is possible to complete the machine without any sketches at all. The most workmanlike way, however, is to set it out first; and I shall presume that those who intend to follow out my instructions will do likewise.

Liners.

After the tubes have been cut to length, which length must include a full allowance for mitreing them, the liners must be brazed in. These liners are intended to give strength where most needed; in other words, where the tube is weakened in the process of brazing, and the after-cleaning-off of the joints. Liners are to be bought ready-made very cheaply; it does not pay to make them. A liner is simply a piece of rolled sheet-steel, which fits closely inside the tube, and when properly brazed up, doubles its thickness just where the strength is required. The following joints require liners—the steering-post at the lower end, where it is brazed into the crown; the top of the forks where they also fit into the crown; the top and bottom tube, both at the steering-socket joints and where they are joined to the saddle-lug and crank-bracket; the diagonal tube where joined into the bracket, and the rear end of the compression stays, where they fit into the crank-bracket;—in fact, wherever there is a joint in which a liner can be used, it should be put in. The weight is inconsiderable, and by their use the tubes can be at least a couple of gauges smaller in size with equal strength.

Many cheap machines entirely dispense with liners on account of the expense entailed by the double brazing and fitting, but to ensure safety these have to be made with thicker tubes, and, as a natural consequence, are much heavier than the better-made article. Further, owing to the vibrations set up in the frame when in use, there is always a chance of a tube breaking short off close to a lug. In an unlined frame these vibrations are suddenly checked at the point where the metal becomes reinforced by the extra substance of the lug. Crystallization sets up, and the tube, although strong, snaps at its weakest part, where it has been reduced in strength by the fire and the cleaning off. When a liner is used, the vibrations are gradually reduced to almost *nil* before the lug is reached; and as this portion of the tube is so much stronger than it is in the middle, it has no inclination to break. The weakest spot not being subjected to the greatest strain, it is in a position to stand the hardest work with impunity. All liners should be made with either serrated or inclined ends; otherwise they may to a smaller extent produce a similar state of things to that caused by the stiff edges of a lug. When no liners are used in a frame, its strength and durability are much enhanced by filing away the edges of the



MILITARY CYCLIST TILTING AT THE RING.
(From Photograph by Frank Foulsham, 144, Adelaide Road, N.W.)

lugs to a fine knife edge, and afterwards reducing them until they taper from their thickest part to an almost invisible joint with the tube. It is never advisable to make the ends of a lug above a thirty-second of an inch thick, and a good workman will remove still more of this after brazing up, actually increasing the strength by so doing.

Brazing.

The method of brazing cycle joints is very similar to that used for other brazing; the only differences worth mentioning are that gas is the medium generally used, and that in factories it is not common to apply either the spelter or borax until after the metal is at a good red heat. As my remarks more concern the amateur, I will endeavour to teach him how to make a good sound brazing, which will only show a fine line of brass after being cleaned off, and form a piece of work which can be either polished or plated without requiring any subsequent touching up to fill up vacant places. Firstly, the pieces to be joined must be cleaned quite bright, and should be a close fit. If the joint is a long one, some nicks should be filed in either the lug or the tube to allow the brass to run along the full length of the joint. A sharp triangular file does very well, and six channels are recommended. These are only necessary when the fit is a close one, and is what engineers would call a "driving fit." This applies more particularly to work done in the lathe, as an ordinary amateur is not likely to file out any joint so true as to prevent the spelter running its full length.

After the joint has been fitted it should be taken asunder, and any grease or oil removed with emery cloth. Then some good powdered borax, mixed with water to the consistency of cream, must be rubbed over each surface, and, if the joint is a closed one, some powdered spelter, mixed with an equal proportion of borax, be put inside it. From half to a full-sized tea-spoonful is enough, according to the size of the joint. If the joint is an open one no spelter can be got inside, as is the case with a tube in a crank-bracket bored right through; under these circumstances a coil of fine brass wire must be tightly bound just above the lug, and this be covered with the wetted borax. Some kinds of wire are almost useless for brazing, as the brass will not run nicely. The best is a golden coloured wire, sold expressly for brazing, and for the use of poachers in snaring rabbits and pheasants. If the buyer asks at a country ironmonger's for "snaring wire" he will get the right thing.

Pinning.

When the joint has been prepared for brazing, and has been set truly in position, it must be pinned to prevent it shifting in the fire, which may happen when the heat of the fire has expanded the metal and turned a tight fit into an easy one. The method of pinning is simple. A small hole is drilled through tube and lug, and into this a pointed bit of wire is driven with a tack hammer—a little borax should have been previously rubbed into the hole. Common French wire nails make good cheap pins; I never use any other.

Applying the heat.

To complete the work, the part to be brazed is put on the hearth, which is filled with small lumps of broken coke. These are packed around it so as to keep in all the heat possible, and save an undue expenditure of gas. Then the flame of the blow-pipe is played upon the metal, and the heat is graduated, so that at first it is only moderate in extent, until all the water in the borax has evaporated. Borax behaves in a very peculiar manner when subjected to heat. Firstly, it almost becomes liquid ; then it swells up like froth, and as the temperature rises it sinks back and gradually fuses into a substance like glass. The difficult point is to prevent it falling off the joint in the frothing state, leaving the metal unprotected from the action of the flame. If this takes place to any great extent the joint will not be a success. As the heat increases the brass should remain of a golden colour ; if it becomes black it is a sign that it is being burnt, and some powdered borax should at once be poured on it with a long iron spoon. If this is not done the brass will be gradually burnt up, and before it runs will have been reduced to almost nothing but a few small beads of metal, which will fall off into the fire as fast as fused, instead of flowing kindly into the joint like liquid gold.

The blow-pipe flame.

A little practice is required to find out the best method of regulating the blow-pipe flame. Air should not be in excess. If it is the temperature will not be so high, and the uncombined oxygen playing on the white-hot metal will form scale, weakening the tube and preventing sound joints. A blow-pipe flame is at its highest efficiency when the gas supply is just in excess of that required for the blast, and some of it should burn with the outer air among the coke. When brazing a joint the flame should always be directed on the thickest part of the metal, and as much heat as possible kept off the tube. Directly the heavy portions are heated to the fusing point of the spelter the slightest alteration of the flame's direction will suffice to bring the portion of the tube adjoining up to the right heat. Generally it would be found hot enough before the bulk of the metal played on is ready. So soon as the brass is seen to fuse and run about all round the joint, the flame should be shut off. Prolonged heating after this point is likely to drain some of the brass away, and leave vacant spaces at the joint's edges, where it shows most. Should a joint appear to swallow up all the spelter at once, some more must be put on it while still in the flame, and directly this is seen to fuse and run the gas can be shut off and a current of air blown on it to set the brass. Often a portion of a joint does not appear to take the brass, and when this happens a piece of stiff brass wire, kept ready at hand, must be dipped in powdered borax and rubbed over the spot until it is covered with the fused metal.

Inside brazing.

When a liner or other piece of inside brazing has to be performed—and no sight can readily be got of what is happening inside—the workman judges as to the completeness of the operation by several signs. One of these is the vapour of the zinc in the spelter, which takes fire, and burns with a blue flame when the brass melts. This is a sure sign that sufficient heat has been applied. Again, some surplus metal should be run out when a joint is made from the inside. Liners should be well cleaned on the outside, and the tube to receive them also cleaned. Both surfaces should have a little borax smeared over them, and the spelter, mixed with some more borax, should be laid along the split in the liner. So soon as the brass runs it will show through the red-hot tube in the form of a black wave as it spreads round, and, so soon as the blue flame appears at the end, the tube should be revolved once or twice to make sure of a complete job. No pinning is wanted for liners. They should fit tight enough without it; but unless properly brazed in they are quite useless. The tubes should be cut to dead lengths before brazing in the liners, and the mitres cut afterwards. When cutting these it will be seen at once if the brazing has been a success. Only a faint line of brass should be visible between the two surfaces.

Rebrazing and "faking."

It sometimes happens that a brazing in a conspicuous place, such as the lap of a handle-bar, while perfectly sound, does not quite come to the extreme edges of the joint. If left alone, it will remain a constant eye-sore, and look far worse after plating than when first cleaned. This must be "faked." If an attempt is made to rebraze it the metal will certainly be weakened, and success is by no means certain. More often than not the last state of that joint will be worse than the first. The best plan is to scrape the surfaces and, as far as possible, between the joint, with a sharp-pointed tool. Then apply borax, secure a tiny piece of silver solder with brass wire over the defaulting spot, and heat up again. The silver will run at a red heat, amalgamate with the brass, and completely fill the hole with a hard metal, making a perfect job which will defy detection before or after plating.

A bit of silver solder is excellent for rebrazing a joint which has parted from any reason, and is to be recommended for such purposes as the bridges between the back stays and compression stays—joints which frequently fail when a machine gets strained from a collision or bad spill. For building a racing machine it is to be preferred to brass for all the joints, as it holds as tightly, and the much lower temperature at which it fuses does not weaken the tubes so much. I need not mention that it costs about twenty times as much as brass, even taking into account the fact that only a very little is required. To braze up a frame entirely with silver would use up about five or six shillings' worth of solder; but if the time of the after cleaning up is taken into account, it will set off the expense to some extent, as the lesser heat necessary for the silver does not scale the metal to the same extent as brass; moreover, less filing is wanted.

Before an amateur tries his skill at sticking the parts of a cycle together, he should experiment with some odd bits of tube, and thus become accustomed to the work. When he has mastered the knack of making a really good joint with certainty he will be able to tackle a frame with confidence.

To mitre tubes.

When all the liners have been brazed in position, the tubes must be mitred, and although this is more often than not done in a very slipshod manner, I must warn the maker against any such carelessness. I recommend that this mitreing of the tubes be done as accurately as if the joints were to be plain butted ones, without the addition of any lugs to reinforce them. Increased strength will follow, and as the lugs will be relieved from a large proportion of strain, they can safely be filed down much thinner at their base than when the tubes do not meet by some quarter of an inch or more. It is these small niceties that make a good machine so much more durable at a less weight than a cheap one.

Fitting tubes to sockets.

When the mitreing has been satisfactorily performed, the tubes must be fitted to their sockets. Providing that the components have been accurately machined, as will be the case with those sold by reputable firms, all that is necessary is to file the ends a trifle until they fit in by hand-pressure alone, or at the least with a few gentle taps from a mallet. A good plan is to "chuck" the tubes on wooden centres in the lathe, and ease down the ends to the required fit with a smooth file, followed by a little dry emery cloth. The centres of the tubes can be polished at the same time with emery cloth and oil, which will save after hand-work when finishing the frame for the enamellers. The lugs attached to the socket of the ball head are often driven on very tightly, so that there is a chance of damaging the tube in withdrawing them. If the two lugs appear accurately in line, the interior surface clean, and the socket tube also bright, they can be brazed without removing. It is, however, better to get them off when possible, and make sure of the job. A piece of iron or steel turned with a shoulder to fit will drive them off the tube if the lug is carefully placed in the vice so as to prevent it becoming distorted. This is often a difficult job, unless a special rig is made for it, such as a piece of gas-pipe filed to fit and take a bearing under the shoulder in which the ball-race recess is turned.

Getting tubes into position.

So soon as each tube is fitted to its corresponding socket, a sight should be taken down the frame, and the back hub placed in the slots of the compression stays. A straight-edge placed on the rim of the large chain-wheel should just touch the corresponding edge of the hub chain-wheel. It may be found that the frame will be a little out of line here, but so long as the bottom tube leading to the socket tube is in the same plane and parallel to the straight-edge, this does not matter. It is of vital importance that both the diagonal and bottom tubes be at an absolute right angle with the crank axle, and that the socket tube of the head and the diagonal tube be also parallel with one another. Any one with a good eye will be able to discover if these tubes are true. If owing to any defect in the boring of the crank brackets the diagonal is not truly square with the crank axle, it is advisable to do the brazing of the bracket joints first, and then set the diagonal tube truly square before the rest of the frame is jointed up. With good components it will seldom happen that any difficulty is found with the main portion of the frame, and so long as the compression stays are tolerably true they can be left until the frame is cleaned up before setting.

When to braze joints.

Having fitted the frame together and found everything right, select a time when you will have sufficient leisure to pin up and braze the joints without having to stop in the middle of the work. The reason for this is that the moisture in the wet borax, if left standing, will corrode the metal and prevent the joints from turning out satisfactorily. Then make a sufficient number of marks on the tubes to ensure them being put back correctly into place, and take down and smear each joint with wetted borax. Bore a small pin-hole in any tube in which both ends are closed, to allow the heated gas to escape. This should be done in a position in which it will not show. Then introduce a little powdered spelter and borax into the closed joints, and proceed to pin the work correctly into position, and proceed as previously described.

Order of brazing joints.

The best order in which to make the joints is a difficult point on which to advise; but by following out the accompanying directions, the novice cannot go far wrong. First braze in the ends of the compression stays, and do the same with the back stays, supposing that they be not tubes with flattened ends, in which case no work except drilling and filing will be wanted. Then the double joint at the top of the steering-socket can receive attention. It will be found a saving of time to clean off this before going on with the work. Next the frame must be put together, pinned up, some borax and spelter introduced in the top tube (for brazing the saddle-lug), and the lower socket and bottom tube joint can follow. After these operations are complete, the four joints in the crank bracket can be brazed at one heat. To prevent the brass running into the threaded portion of the bracket, some whiting and water, mixed thickly, can be smeared into the thread where the cups are screwed in. It will be found a good plan to adopt the same precaution in the recess for the ball-races in the head. Of course, I need not inform any intelligent workman that all ball-races, lubricators, and loose portions must be removed from the parts before subjecting them to the heat.

Hints on brazing joints.

To help to keep the compression stays in position, a spindle may be inserted between the ends in the same place as the hub spindle will occupy; and I recommend that, after brazing the saddle-lug, the back stays be roughly bolted in position, and secured to the ends of the compression stays with the same spindle as is used to keep them apart at correct distance. A rough piece of iron, screwed for an inch at each end, with two nuts on each portion, is a useful rig for this purpose, and saves the plating on the correct spindle getting damaged during the brazing. Great care must be taken when the work is in the fire that no side strain is thrown on the frame, or the tubes will be distorted. The frame must be so placed and packed up that access can be obtained all round the joint operated upon, and the workman should slightly cool off the work before taking it out of the fire. If skilful, he will handle the frame so that, without fear of bending it, he can, by aid of a wire brush, go over the just finished incandescent joint, and remove a large amount of scale, borax, and melted brass, making the subsequent work of cleaning up much easier. Beginners, however, should not attempt this. Brass at a red heat is a tricky metal, and a joint may be readily started by rough handling before it is properly set.

The fork-crown.

In many sets of components the front forks are sent out ready finished; in others, only the crown is brazed on the steering-post; some, again, have all the parts loose. To meet all cases, I will give the *modus operandi* of the whole work with a rough fork-crown. The crown may consist of either two steel plates roughly stamped out, or it may be a malleable casting with rough-cored holes. The same method of proceeding will apply to each. It must be "chucked" on the face plate, and the three holes averaged so that any error in their position is corrected and cut out in working up. With steel stampings the work will be found to be much truer than when malleable iron is used; and, generally, the piece can be "chucked" readily by holding it in position against the face plate, with the back centre of the lathe, while the securing bolts are made fast. If the holes for the forks are already pierced, two plain bolts and nuts through them will be all that is wanted. Clip bolts can be used, if to hand; and for some crowns, in which the top plate is made with lugs that pass inside the forks, they are the only kind of fastening permissible.

After the centre hole is bored to a tight driving fit for the steering-post at its enlarged end (see later), a cut can often be taken right across the crown, which will lighten the labour of after filing off, and be of assistance if the crown has to be slotted for the forks. The holes for these are generally either roughly cored out in castings or partly pierced in solid stampings. When only partly through the metal, the easiest plan of getting out the superfluous stuff is to carefully mark off the position the forks will assume with a scriber, and drill a series of holes of suitable sizes inside the lines, afterwards plugging the holes and drilling a second set, with their centres at the point between each of the previous ones. Then the little material left can be readily removed with a file. When finishing the holes for the forks, care must be taken to make the fit a good one, and they must be tried in from time to time, to see that they are, as far as possible, true with one another. In fitting a pair of forks, the amateur must remember that the crown will act as a draw plate, and, by driving the forks from the smaller end, it is possible to accommodate them to a slight variation in the size of the hole in the crown. Often the hole to receive them is not exactly the size; it may be a trifle wider and not quite so long. If there is enough room for the fork, it will, when carefully driven, readily adapt itself to the altered condition. By smoking it, or rubbing on a little red lead and oil, the tight places can be found, and a good fit easily made. If they are not exactly true it does not matter, so long as the error is not too great to allow of after correction by setting when the brazing is completed. However, it may be remarked that a good workman will leave but little to do in this direction. In factory practice, a "jig" ensure accuracy.

The centre tube.

When the forks are properly fitted, the centre tube demands attention. This is generally made from a bit of 18-gauge, or stouter tube. At one end the thread is cut for the lock nut, while the other is expanded by driving down it a tapered mandrel while hot, until it is possibly some thirty-second of an inch larger than its original size. This is for convenience of fitting the bottom ball-race, and to allow of cleaning up where brazed into the crown. If left its original size, when it had been filed clean after being brazed, the ball-race would be found to be loose when in its correct position.

The steering-post.

A good stiff liner must be carefully brazed into the steering-post, and, as this is the most vital portion of the whole frame, care and judgment must be used in proportioning the thickness of the liner to the rider's weight. An 18-gauge post and liner will do well for any weights up to eleven or twelve stone; but beyond this it is advisable to use stouter tubes and liners. I once used 14-gauge material for a very heavy man approaching twenty stone, and although the rest of the frame was as nearly as possible of ordinary strength, it carried him well.

The forks. When steering-post and forks are fitted, a small pin should be put through the post and crown to prevent it turning round, and the bottoms of the forks secured with a false spindle, as described for the compression stays. They can then be brazed up, liners being inserted in the forks and secured with the top plates, if the crown is an open one, by a small pin. If fork-liners are used they must be cleaned, boraxed, and some spelter put inside before the forks are finally pinned together. I generally braze them up at the same time as I do the other three brazings, and by a turn of the wrist at the finish of the work, secure a proper flow of the brass round the liners. If the forks fit nicely, the liners can be brazed up first, and the end plates inserted afterwards, and brazed in at the same time as the rest of the work is done. Fork-liners, however, seldom fit nicely, and are generally but poor jobs when brazed in, owing to the inside of the forks being so difficult to properly clean out. On this account, I often question if they are worth the trouble of putting in, and would prefer their absence for my own use if a double heat were required for the work. With a round tube and a similar liner a perfect joint can be made. This I have often tested by cutting the tube longitudinally in two with a saw; but similar experiments with forks have shown me that the liners only touch in a few places, and, consequently, are often worse than useless, as they prevent a bent fork being straightened. The edges of the imperfectly brazed liner cause bulges which cannot be worked out after an accident.

Supposing the brazing of the forks to have been accomplished successfully, and the joints nicely cleaned off by filing, followed by a little emery cloth to remove the scratches of the file, then the holes for the front wheel spindle must be accurately bored. A rough trammel can be made from a piece of wire, and by plugging the hole in the steering-post, and measuring from it, the distance can be set off. It is advisable to allow for half an inch clearance under the brake, and the thickness of the spoon under the crown must be calculated and allowed for. When the correct distance is found, a centre pop will mark it, and to ensure accuracy a small drill should be put through first, to be followed by one of the correct size.

To set the forks, if not quite central, or unequally raked, the steering-post must be tightly gripped in the vice with a pair of iron or wood grooved blocks, and the fork, or forks, heated up to a dull red heat with the blow-pipe, and firmly but steadily forced into position by hand or lever pressure. If twisted at all a bar placed between them will at once force them over, while they are easily bent sideways by hand pressure alone. Beware of attempting to pull them over cold ; they will readily come sideways, but generally are damaged in so doing. They can often be levered forwards or backwards cold without damage, so long as the amount is small. But a side bend is disastrous, on account of the flat section of the narrower elipse having a tendency to cave in. I need not mention that the less that is done in this direction after brazing up the better.

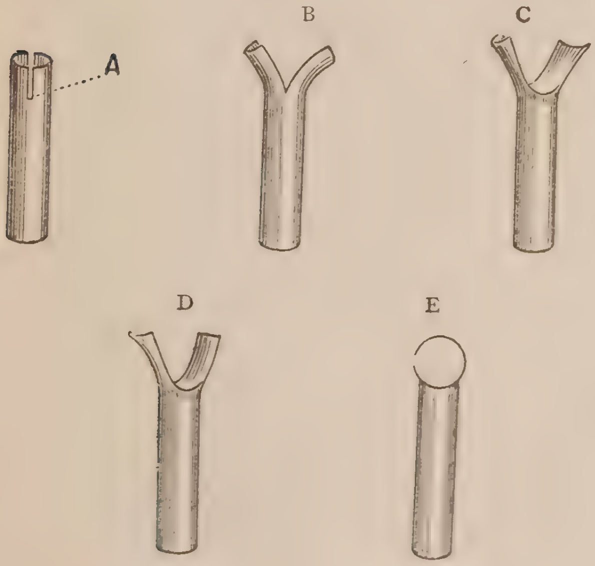
Cleaning off.

After the frame and forks have been brazed up and cleaned off, the handle-bar and saddle-pillar must be tackled. But before proceeding to them, a word or two on the cleaning up may be of service. When a joint is cooled down after brazing it looks an ugly affair, and the fused filth from the borax and spelter give it a burnt-up appearance. The scale with which it is covered is extremely hard, and gives a file a poor time of it. In factories it is usual to remove it with a sand-blast. The amateur had better take a coarse old file and get off the rough with it, using newer and finer files as the work proceeds. He must be extremely careful not to remove more than the slightest skin of metal from the tubes themselves. One untimely sweep with a bastard file would almost cut through a 22-gauge tube, and much weaken a stouter one. Rather leave one or two black spots as witness-marks than go in too deep. Clean the lugs up as much as you like, but be easy with the tubes. For cleaning up a frame can be gripped in the vice by means of two lead or wood blocks, with grooves in them to embrace the tube nearly all round. If a tube is gripped without this protection it will be dented in, and the work spoiled. A crank bracket can be readily gripped from end to end without any protection beyond the copper jaws, but if held across the barrel will be sufficiently distorted to prevent the cups being screwed in. I once distorted a crank bracket of very weak design by incautiously placing it on a lead block while I drove a tube in with a mallet. It rapidly assumed an oval shape, and it was only by making a screwed drift much tapered at one end, that I eventually straightened it.

Handle-bars and saddle-pillars.

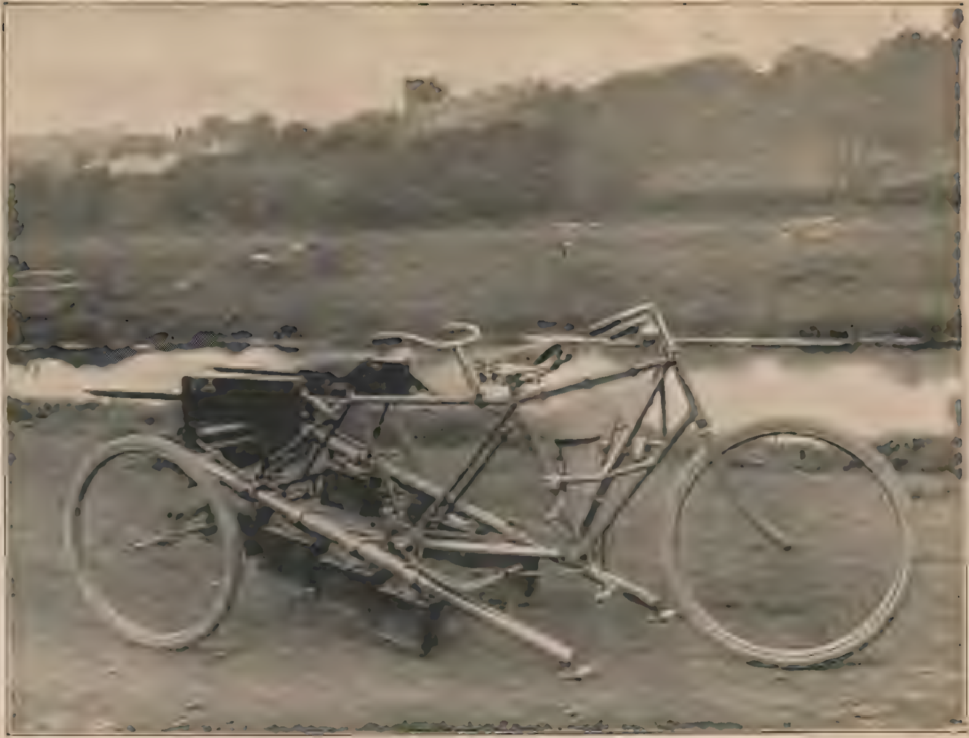
Handle-bars and saddle-pillars require careful treatment as regards the fastening of the horizontal portions to the stems. Many sets have them complete, others only give the rough tubes. The bending of the handle-bar itself is somewhat difficult, but the amateur can buy them ready bent. If, however, he wants to do the work himself, let him pack it tightly with sand, and insert one end in the grooved blocks in the vice. Then by careful heating, he can bend it a bit at a time by means of a tubular lever, such as a length of gas-pipe. Beware of trying to bend it round a flat substance, such as the beak of an anvil; it is sure to become flattened in the portion where it touches. In factories handles are bent cold, with a patent spiral spring mandrel inside them, which prevents flattening or cockling, and the usual method is to force them round a cast-iron templet, or mould, with roller pressure applied by levers. Given only a little patience and skill, the method I recommend is certain and sure, so long as the workman is skilful enough to be able to make both sides alike. The best size for a modern handle-bar is 20 or 22-gauge tubing, with an 18-gauge stem if one inch in diameter; if only a $\frac{7}{8}$-inch, or ·903-inch, stem is permissible, then the stalk should be 16-gauge. Care must be taken to select tubes for both saddle-pillars and handle-bars which will, when cleaned up, telescope into the saddle-lugs and steering-post.

Methods of Making Lap-joints.



"Lapping."

The customary plan of jointing these stalks to their tubes is by means of what is called "lapping"—a cheap and easy process when the requisite tools are to hand, but one likely to try the skill of the novice to no small extent. The following is the usual method of making a "lap":—A portion of the end of the tube in which the lap is to be formed is slit down until the cut (Fig. A) is nearly equal in length to half of the circumference of the tube round which it is to be lapped. The sides and bottom of this slit, which is made with a smooth hack-saw terminating in a drilled hole, must be smooth and free from sharp angles, or splits will follow in the after working. Then while the tube is securely gripped on a mandrel held in the vice, it is heated by the blow-pipe, and a tapered drift driven down it, which expands it and opens the two sides (Fig. B). This drift is followed by a second one, which expands a portion of the tube below the lowest limits of the slit, until it assumes the bell-like shape shown in the illustration (Fig. C). It is in making this last portion of the lap that cracks are most likely to make their appearance, and when they do the slit must be lowered with a round edged file until it is below the danger spot, and



A Rudge-Whitworth Machine Gun Tricycle.

another trial made, if necessary, at a greater heat. Much depends upon the tube. Some can be easily worked almost cold into any shape, while others split at the slightest provocation.

The next process is to shape the already half-finished lap by driving a round piece of metal, a trifle smaller in diameter than the tube to be lapped, on to the bell flatways, so as to round the bell and adapt it to receive the tube (Fig. D). When the bottom of the lap has been shaped correctly, the two top pieces are flattened nicely, bent round a mandrel of the same size that the lap is to be, and accurately cut to length, so that when the work is pinned up for brazing, the two ends just butt (Fig. E). Pinning up must be done carefully. Some rough form of clamp must be rigged up to hold the two ends of the laps securely while the holes for the pins are being drilled. A couple of lathe-carriers can be extemporized for the purpose. If all is not tight and a close fit made, the joint will not be neat, and nothing shows more than bad work about a handle-bar. Before driving in the pins the inside of the joint must be well cleaned and coated with borax. The brazing should be done by inserting the spelter inside the socket. The socket should be upright during the operation, and the heat shut off so soon as the brass is seen to run out at the butted ends of the lap. It is well to use plenty of spelter, to make sure that every little opening is properly filled, for the joint is one by which experienced riders and critics form their judgment of the maker's skill. For very light racing bars, weight can be saved by using thinner tubing, and making the handle in two pieces, with a five-inch liner brazed in the middle, the lap being so placed as to cover the joint.

Saddle-pillars are "lapped" in exactly the same manner, save that the "lap" is made on the skew, so as to bring the horizontal portion to the correct angle. The process is the same as in the case of a handle-stem, except that the angle is first ascertained, either with a bevel gauge or by means of a wire templet bent to shape. From this the depth of the slit is marked out, deeper on one side than the other, the final moulding to shape with the round bar being performed at the correct angle. Laps are never so strong as inserted lugs, and though to some extent used for frame work by some makers, are not recommended except for saddle-stems and handle-bar stalks, where the tube is thick. Thin tubing is much weakened by the several heatings necessary for the process. If no lug can be obtained for a repair or alteration, a workman who is skilful at tube work will readily make one, either on the tube to be joined up or else from a larger piece of stouter metal, which will telescope over it. As the work requires no small amount of skill, and is often very useful, I recommend amateurs practising with waste pieces until they master the art. Given a good tube to start with, it is astonishing how many different shapes it can be made to assume, and how useful it is to be able to fashion an angular lug, fork crown, or belled bridge, from it, which if made with forge and hammer from the solid metal would entail no end of smithing work and subsequent machining up.

Cleaning screw threads.

When all the brazings are done, and the frame is cleaned up, it must be fitted together and sighted for truth. The amateur may find that the borax has got into the screw threads in the crank bracket, or that the whiting with which I recommended him to protect them has set hard, and so prevents the entry of the cups. The best method of cleaning out these, when a tap is not to hand, is to take an ordinary chaser, and, using it as a scraper, clean out the threads. With a little diligence a tight, ill-fitting, or choked thread, can be transformed into a good fit; of course, the chaser must be of the same pitch as the thread. By the test already described, with the straight-edge on the rim of the chain-wheel, and by the method of sighting on each side of the steering-socket and diagonal to ascertain if both are true and parallel, he will see that all is right. If not, setting must be resorted to, and if that has to be done I only hope that the follower of these instructions will find nothing worse than that the compression stays are a trifle out, although small errors in other parts of the frame can readily be rectified.

"Setting" the machine.

His method of procedure should be as follows: Let him ascertain by spinning that the large chain-wheel is true, if not he must proceed to true it by placing a piece of chalk against the sides while spinning it in its bearings. This will mark the errors; and the average must be struck so that the least amount of work is required to get it true. Choosing a most prominent spot, a weight is held tightly against the opposite end of the axle, and a tap or two of a mallet given on the rim. It will easily bend, and care must be taken not to overdo it ; generally two or three blows will suffice to true it almost perfectly. Then it will be ready as the starting-point from which all the frame is trued up. Firstly, the compression stays are set true by blowing hot and bending by hand pressure ; the crank-axle bearings and chain-wheel can be left in and kept comparatively cool by a wetted rag wrapped round the bracket. Each stay must be set true separately until the hub goes in nicely without springing, and the back stays fit on the hub-spindle and saddle-bolt without effort. If the bridge has not been supplied with the compression stays it is best left until this stage, and can be now made and fitted to the work accurately. I recommend a large bridge, well belled at the ends, and properly brazed in. It is of great service in resisting the pull of the chain, and bears a large amount of strain.

If, when the chain-wheels are in line it is found that the rest of the frame is not true, it must be set. Should the error be excessive this will be a great misfortune, as set tubes always show short bends close to the sockets. Moreover, the task of setting a frame which is much out of truth is always a difficult one, both for an amateur or any one else who has not a specially constructed jig ready for the work. First, the error must be carefully located. It may be that the steering-socket is out of truth with the diagonal tube, or the front of the frame may not be in correct line at right angles with the crank axle. In the latter case the frame must be gripped across the bracket in a strong vice, with the copper jaws interposed. Then the bottom tube must be blown hot just clear of the lug, and a firm pull put upon the socket until it is seen to give. The same process is then repeated with the top tube, heating it just clear of the saddle-lug. If the socket and the diagonal are not true with one another, ascertain by the straight-edge test which is true with the chain-wheel, and proceed to set the other by inserting a strong bar and forcing it over in the required direction, heating where necessary.

In all cases of double bends two blow-pipes applied at the same time are of great assistance. If only one is to hand, and the work is done by one tube only, it is always well to warm up any other tubes which may have been put in a state of tension by the work, as the pull they will be constantly exerting will in time cause the frame to fall out of truth. For instance, if the diagonal tube is set, the top tube should be heated up close to the top lug on the socket. Many frames are set cold in factories, and are left in a state of tension, which results in their soon getting out of truth, either spontaneously, or by a very slight strain in use. The amateur should always endeavour to get everything as true as possible before brazing up, and then by careful manipulation he will leave himself but little to do afterwards in the way of setting, which, by the way, I always look upon as a slur upon the workman's skill. At the same time I must admit that the best-fitted work will occasionally buckle in brazing, owing to internal strains in the castings or stampings.

The wheels.

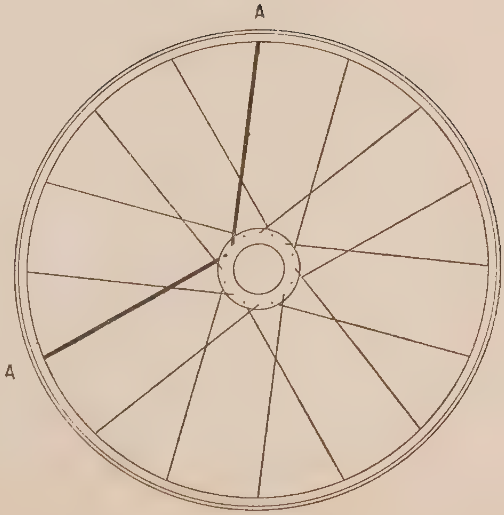
The next step is to tackle the wheels, which is by no means so difficult as might be imagined. It only requires a little patience and study of cause and effect. If a novice commences in anything like the determined fashion that a good hand would adopt, he will soon begin to imagine he has an electric eel under his care ; for the wheel will assume every shape but the right one, and afford quite a study in serpentine forms. The first thing to be done is to carefully mark off the rim with the correct number of holes for the spokes—generally thirty-two for the front and forty for the rear wheel. If any difference is found between the weight of the rims, or one appears stiffer than the other, select that one for the driving wheel. This is presuming that both tyres are of similar size. If a smaller one is required for the front wheel it will, of course, be marked off with the lesser number of holes. To some it may appear a difficult task to equally divide a rim into the requisite number of spaces, but systematic work will easily overcome the obstacle. Measure the circumference of the rim with a piece of fine wire. Then measure the wire and divide the length arrived at by the number of holes. As this will be the circular pitch, and as the dividers will assume a straight path between each hole, set them a trifle short of the quotient, say one thirty-second of an inch. If any error is found on going round the rim for the first time, alter the dividers to the extent of the error, divided by the number of holes.

Thus, supposing that there are thirty-two spokes, and that on going round for the first time an error of half an inch is apparent, then an alteration of one-sixty-fourth of an inch will put matters straight. Any trifling error of, say an eighth of an inch, can be averaged among the nearest half-dozen holes to where the start is made. To prevent boring a hole in the joint of the rim I recommend that the start be made from there, and the first two spaces equally set off, one on each side, the valve hole being afterwards marked off as nearly opposite as possible. If the rim is of wood, pencil-marks will be sufficient to prevent any error in drilling. If, on the other hand, a metal rim is used, a piece of stick chalk is the most suitable for marking purposes.

The actual drilling is best accomplished in the lathe, although it would be possible to do it with a small "Miller's Falls" drill, especially if a solid or Westwood metal rim is used. I should not advise you to attempt to bore a wood rim by any other means than the lathe or a drilling-machine, as some sort of stop is essential, and a very high speed is necessary to ensure cutting the holes clean. An ordinary twist-drill is best for steel rims, and for wood ones a twist-drill set inside a cutter, similar to the end of an auger, which bores out the countersink at the same time as the hole is drilled. All holes should be only just large enough to allow the nipple to pass. If too large, wet will enter and rot or rust the rim and the fabric of the tyre. Supposing the lathe is used for drilling, a rough blocking must be put on the bed at the right height, so that the nipple hole will be at the correct angle to line up with the hub flange. Then the back centre, with a forked centre in it, must be brought up close to the mandrel, and the rim laid on the blocking at the extreme end, while the portion to be drilled is pressed against the drill by the forked centre. When drilling a wood rim begin tentatively, and so soon as sufficient countersink is made to seat the washer, note the position of the hand-wheel, and mark its uppermost point. Then withdraw the rim, put in a washer, and try how the nipple goes through. If enough comes through—say all the square portion—the countersink is deep enough; if not, try a little deeper until all is right. Then proceed and drill *every alternate hole*, until round the rims. Remove the rim, turn it over, and drill the other set of holes. The nipples for wood rims are very much longer than those for steel rims, and it is necessary that the right kind be obtained, for if the countersink was made deep enough to take ordinary nipples, the washers would pull through the rims.

The best washers for wood rims are made with a serrated edge, and to some extent prevent any splitting of the rim. Jointless rims require a special washer, and should have a hole about seven-sixteenths of an inch drilled right through the outer skin of the rim through which the washer is passed, and allowed to rest on the lower portion of the rim. Westwood rims do not require any countersinking at all, but have a special washer which takes the head of the nipple. Solid rims can just be touched with a large drill to remove the burr, but care must be taken not to go too deep, or the nipples may pull through. I generally dispense with all countersinking with them, and clean out the bottom of the rim with a round file. The speed at which the drill should run will depend upon its size. As a rough guide, I may mention that for an ordinary hole of number eight gauge in metal rims about three hundred revolutions per minute will be correct; and for the larger hole to admit the washers in double hollow and jointless rims about one hundred. For wood rims the speed cannot be too fast; it should not be less than fifteen hundred; and ten thousand revolutions per minute would be the rate at which I should run the special machine, made on purpose for factory use. Slow speeds do not answer well for wood, and the higher the speed the cleaner the cut. If metal is worked too fast it heats the tool and causes it to lose its temper and become dull.

When the rim has been drilled both for spokes and valve, it is ready to be built up. Before doing this, however, the spokes will require cutting to correct length and screwing to receive the nipples. The proper way to ascertain the exact length of the spokes is to set out a portion of the wheel on a piece of paper, and, after allowing for the extra length occasioned by the spread of the hub flanges, to take off the length from the actual sized drawing. As a guide and a check I append a few measurements, which I have used and found correct. The length of the spoke is governed by the amount of tangent in the wheel as well as by the diameter of the rim. The tangents permissible really resolve themselves into two, which for the sake of distinction I will describe as the true tangent and the half tangent. The illustrations will show the difference clearly. There is but little to choose between them, and for preference I advise the half tangent as being less likely to cause the spokes to break. It does not, of course, form so completely rigid a wheel as the true tangent, but allows of a trifling give when the wheel is hard pushed, and to my way of thinking adds extra life to the machine. That it does not stress the spokes to the same extent I have proved by finding wheels of full tangent fail owing to the wire not being of the very best, but stand perfectly with the same spokes of the same inferior wire when rebuilt with a lesser tangent. Excepting for appearances there is no advantage in the tangent for steering-wheels, and I have built these wheels with spokes intended for tangent set radially, and found them answer well. As the old-fashioned plan of direct spokes is now obsolete, I shall not touch on the method of building these wheels; but any intelligent workman who could build a tangent wheel would have no trouble with a direct wheel.


A
A

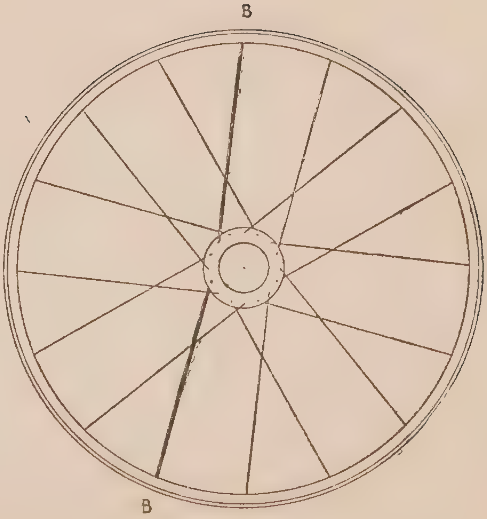

B
B

TABLE OF SPOKE LENGTHS.

Approximate only.

28-inch	wheel with	$1\frac{3}{4}$-inch or $1\frac{5}{8}$-inch	tyre:	front	wheel	$12\frac{1}{16}$ inches.
	,,	,,	,,	back	,,	$11\frac{15}{16}$,,
26	,,	,,	,,	front	,,	$11\frac{1}{8}$,,
	,,	,,	,,	back	,,	11 ,,

Calculated for solid rims, hub flange of average diameter.

Add $\frac{1}{16}$ of an inch for Westwood rims.
Deduct $\frac{1}{4}$ of an inch for jointless rims.
Deduct $\frac{1}{16}$ of an inch for wood rims.

Larger or smaller tyres require the difference in their diameter to be allowed for in spoke lengths.

The above are for true tangent wheels. For half tangent wheels deduct $\frac{1}{4}$ of an inch.

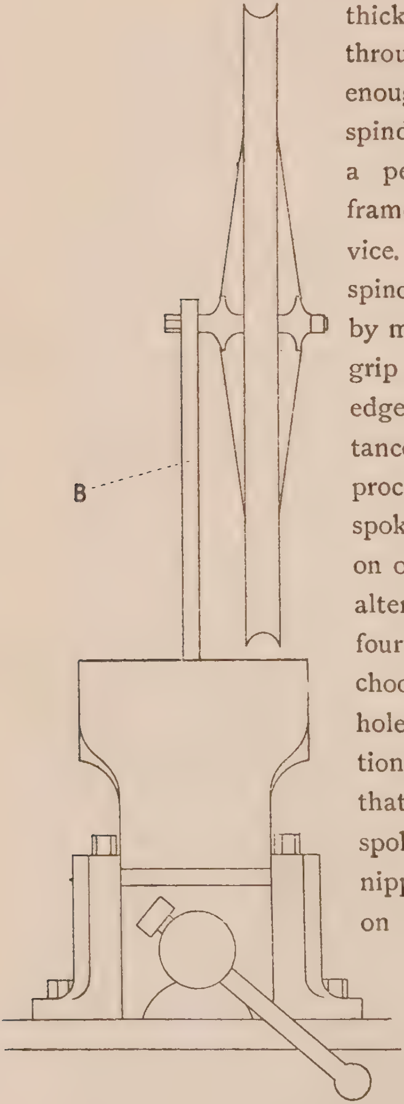
Those of my readers who have studied the pages on the choice of a machine will remember that I discussed the question of the gauge of the spokes as suited for different weights and purposes, so that now I merely need remind them that for ordinary work 15 for the driver and 16 for the steering-wheel is a safe rule, and should only be exceeded for heavy and decreased for very light weights, when the quality of the spoke-wire is known to be above suspicion. If good double-butted wire can be obtained it will be quite safe to use fourteen to sixteen-butted for the driver and fifteen to seventeen-butted for the steering wheel. The builder must, however, assure himself that his wire is really high tension, as some butted spokes are very weak in the centres owing to their having been reduced by shaving off the excess of metal in the middle. As this removes the hard skin of the wire it considerably reduces its strength, and often causes it to pull in two in the centre.

A good plan of gauging the length of the spokes is to nail a piece of wood at the correct distance from the edge of the bench, and to bring up the head of the spoke against it, the cutting edge of the nippers being held close to the edge of the bench. Each cut can then be made at exactly the same distance from the stop. By this means it is possible to cut them rapidly with no appreciable error in length, which the amateur will find subsequently of great assistance in getting the wheel true. When the spokes have been cut to length they must be threaded, and for this purpose it will be necessary to have a die to correspond with the thread in the nipples. These are generally screwed to "Abingdon" pitch, but to make certain it is as well to buy the die at the same store as the nipples are purchased; they cost retail about two shillings each. If a lathe is at hand the die can be mounted in either a self-centring chuck, or a rough wooden

Military Cyclists

one, care being taken to see that the hole is central. Then the distance which the screw-thread shall be carried down is determined; and this should be so set off that about one-eighth of an inch of unthreaded wire is concealed in the countersunk portion of the nipple. To allow any portion of the thread to show is rightly considered bad work, for it will much enhance the chance of the wire breaking where weakened by the thread. The hand-rest can be set at the right place on the lathe-bed to show where to stop, and so soon as the head of the spoke passes this mark the lathe should be at once reversed and backed out at full speed, the actual threading being done at a comparatively slow speed of about two hundred revolutions per minute. Each spoke should be dipped in heavy oil before being put into the die, and it is best held in the hand with one of the small spoke-grips obtainable at cycle shops. With a boy to screw on the grips it is easy to thread a gross of spokes an hour in an ordinary foot-lathe.

The first step in building up the wheel is to procure a piece of flat iron about eighteen inches long by one inch wide and three-eighths of an inch



thick, and to bore a hole through one end large enough to take the hub spindle. This will make a perfect wheel-building frame, when held in the vice. Secure the hub spindle in the hole tightly by means of the nut, and grip the iron across the edges at a convenient distance in the vice. Then proceed to insert all the spokes in one hub flange, on one side of it, in each alternate hole, and in every fourth hole in the rim, choosing, of course, the holes in the rim apportioned to the spokes on that side. When all these spokes are fixed, and the nipples loosely screwed on by a few turns, put one spoke in the same flange from the opposite side into one of the vacant holes, and, twisting round the rim, find the hole which will give the correct tangent determined on. A glance at the spoke springing from the next hole will show if the position is correct, and when it is found, follow on until that flange is filled. Then proceed with the other flange, taking any hole which first comes to hand, and making sure that the first spoke is properly located and follows at a similar angle to its neighbour on the other side. Although it is not of much importance save for the sake of appearance, see that the spokes in both flanges inside the hub incline the same way ; do not have one half forward and the other half backward When once the first spoke is correctly placed the rest of the series follow as a matter of course, and when all are in place, and a careful examination shows them correct, proceed to tighten each until the head of the spoke just shows through the nipple. By that time, if the lengths have been correctly cut and the tangent is set correctly, the wheel should have a trifling tension and be comparatively true. Now will be the time that the amateur's troubles will begin ; but if he is careful there is no reason why twenty minutes' work should not put him in possession of a true and good wheel.

First, he should bring up a fixed piece of very soft chalk or whiting against the edge of the rim while the wheel is revolving. This will show the places where it is out of truth, and by gently tightening the spokes, on the opposite side to the chalk marks, the rim will be drawn into rough truth. Directly the bulk of the "wobble" is out of it, it must be trued for diameter, and this is the most difficult of the two operations. The piece of iron which acts as the frame is dropped in the vice until the rim just touches it at the highest portion of the wheel. Bulges are removed by tightening the spokes equally on each side, and the low places are allowed to expand by slackening the spokes above them until the wheel will revolve without touching when the frame is lowered, so that at no portion is the rim clear of the vice jaws by more than a thirty-second of an inch. Then the operator proceeds to give it a final touch, and obtain truth at the sides. To this end he now proceeds to work as before with the chalk, but instead of only tightening one side, which would put the wheel out as regards diameter, he loosens the spokes on one side as much as he takes up on the other, finishing off with quarter turns of the nipples only. When the wheel is quite true he puts it on one side for a day or two to set, and when again taking it up often finds it out in places to the extent of some sixteenth of an inch. However, a final touch will speedily put it right again, and in the case of a metal rim this should be performed after it has come back from the enamellers. If the tension be found slack each spoke must be tightened up either a half or a whole turn all round, until it is found that the wheel is sufficiently tight. I recommend as much tension as the spokes will carry, and if the rim is a good and true one each spoke should ring the same note when twanged with the thumb.

In the foregoing I have not mentioned "dished" wheels—alas! but too common with amateur wheel-builders. By "dished" I mean wheels in which the hub flange is not absolutely in the centre; in other words, if a line were drawn through the centre of the rim it would pass on one side of the centre of the hub. If a wheel is true, and a sight taken from one edge of the rim to the other, it should pass through the exact centre of the hub, a point generally indicated by the oil hole, which can be taken for granted as centrally drilled. If on examination any "dish" is found it can be quickly set right by the simple expedient of slackening off the spokes on the side on which the rim is found more distant from the centre, and afterwards tightening up to a corresponding amount on the other side. I usually know at a glance how much will be required to fix a wheel true; but the amateur who has had no previous experience had better proceed cautiously. If the error is much a whole turn can be given to each spoke, whereas for a small amount a quarter-turn would be quite enough to give each nipple, and will have an appreciable effect in drawing over the rim.

Plating and enamel.

When wheels and rims are finished the work may be said to be drawing to a conclusion. All that will remain will be the plating of the bright parts and the enamelling of the frame. *Finis coronat opus;* and unless these details are properly carried out the work, however good, will lack that captivating appearance which goes so far with the uninitiated portion of the public; but which, as a matter of fact, does not add one atom to either the run or wearing qualities of a mount. If from position, or motives of economy, it is desired to leave out this ornamentation, my advice is to paint the frame and as much as possible of those portions usually plated with lead-coloured paint. This gives the idea of work turned out by an engineer, and will look much better than the tarry appearance presented by machines covered by the enamels usually sold to amateurs. From experience I can assure my readers that it is almost impossible to enamel any cycle without a proper oven and the suitable japan for use in it. If the machine is a success—and there is no reason why it should not be so, providing a modicum of skill is used in its construction—I recommend the maker procuring a transfer with his name on it, and affixing the same. By applying to the British Transfer Works at Plaistow he will be able to get half a dozen transfers for three and sixpence. He should then brush them over with gold size, taking care to apply it only up to the edges of the design, and as thinly as possible. After waiting until the size is "tacky"—that is to say, for probably a quarter of an hour—he can apply the transfer. After having rubbed it in close contact and well wetted the paper, keeping it wet for some twenty minutes, it can be peeled off, leaving the design in gold on the frame. To finish it off it should be sponged clean, after drying for an hour or two, and then have a coat of quick-drying hard white spirit-varnish.

Chain and gear-case.

I recommend that a twin roller chain be fitted, and that a gear case be used to protect the same. A leather gear-case will cost about twelve and sixpence, while a Carter will run into some thirty shillings, plus the carriage of the frame to the Midlands to have it fitted. The ordinary leather cases are sufficiently troublesome to fit nicely, but the Carter presents so many difficulties that many firms who have not a regular gear-case hand find it more economical to pay the carriage and make sure of a proper fit, rather than do the work themselves. Of course, when money is not an object, no case can compare with the "oil-bath Carter."

PRINTED BY WILLIAM CLOWES AND SONS, LIMITED,
LONDON AND BECCLES.

April, 1897.

NEW & RECENT NOVELS PUBLISHED BY A. D. INNES & COMPANY BEDFORD ST. MDCCCXCVII.

31 & 32, Bedford Street,
Strand, W.C.,
April, 1897.

NOVELS AND FICTION PUBLISHED BY
A. D. INNES & CO.

NEW ONE-VOLUME NOVELS.

By J. C. Snaith, Author of "Mistress Dorothy Marvin."

Fierceheart the Soldier.

Crown 8vo, cloth, 6*s.*

By C. M. Campbell.

The Ne'er-do-weel.

Crown 8vo, cloth, 6*s.*

By Francis Gribble.

Only an Angel.

Demy 12mo, cloth, yellow edges, 2*s.* 6*d.*

By Max Pemberton.

Christine of the Hills.

Crown 8vo, cloth, 6*s.*

"Assuredly he has never written anything more fresh, more simple, more alluring, or more artistically perfect."—*Daily Mail.*

By Isabel Clarke.

The Episode of Alethea.

Crown 8vo, cloth, 6*s.*

"The author deals with admirable taste and tact with the situation. . . . The story is one of high merit from beginning to end."—*Scotsman.*

By Eden Phillpotts.

Lying Prophets.

Crown 8vo, cloth, 6*s.* *Third Edition.*

"An excellent novel, . . . a piece of serious and admirable work, . . . not unworthy of a place with George Eliot's 'Adam Bede' and 'Mill on the Floss.'"—*Pall Mall Gazette.*

NEW SIX SHILLING NOVELS.

By Esther Miller.

The Sport of the Gods.

Crown 8vo, cloth, 6*s.*

"It is very well told. . . . The novel is exciting, and preserves its interest to the end. . . . Excellent story."—*Athenæum.*

By Nellie K. Blissett.

The Wisdom of the Simple.

Crown 8vo, cloth, 6*s.*

"An original and very clever story, the satire light yet trenchant, and the characters drawn by keen and graphic touches . . . there can be no doubt as to the ability and charm of Miss Blissett's book."—*Pall Mall Gazette.*

By E. F. Benson, Author of "Dodo."

Limitations.

Crown 8vo, cloth, 6*s.*

"Mr. Benson has written an interesting and truly human book. His range is much wider than it was, his character-drawing has gained in depth, delicacy, and precision: while the sparkling dialogue which we enjoyed in 'Dodo has lost none of its old brilliancy."—*Daily Telegraph.*

By Francis Gribble.

The Lower Life.

Crown 8vo, cloth, 6*s.*

"A very remarkable novel, well thought out, well sustained, and inspired from first to last."—*National Observer.*

By G. B. Burgin.

Tomalyn's Quest.

Crown 8vo, cloth, 6*s.*

"Mr. Burgin has just scored a second shining success with 'Tomalyn's Quest,' a tale of the keenest interest."—*Daily Telegraph.*

By W. L. Alden.

The Mystery of Elias G. Roebuck.

Crown 8vo, cloth, 6*s.*

"Mr. Alden has the true gift of humour. . . . It is impossible to read the collection of short stories without genuine enjoyment."—*Times.*

By C. R. Coleridge and Helen Shipton.

Ravenstone.

Crown 8vo, cloth, 6*s.*

"The love interest of 'Ravenstone' is twofold, and is admirably sustained throughout this bright, vigorous, and refreshing story."—*Daily Telegraph.*

By Howard Kerr.

Leeway.

Crown 8vo, cloth, 6*s.*

"The story is well written; the character of Dick is undeniably a capital study."—*Daily Chronicle.*

RECENT POPULAR 6s. NOVELS.

By X. L., Author of "Aut Diabolus aut Nihil."

The Limb.

Crown 8vo, cloth, 6*s.*

MR. GLADSTONE writes: "Pray accept my thanks. . . . I was so imprudent as to open it at once, and since that act have found great difficulty in laying it down."

"An excellent, sometimes even entrancing, novel. . . . Full of the deepest interest."—*Glasgow Herald.*

"'The Limb' is unquestionably one of the most fascinating books of the season." —*Birmingham Daily Gazette.*

By ROMA WHITE.

A Stolen Mask.

Crown 8vo, cloth, 6*s.*

"A capital story, and Mrs. Roma White tells it with a delicate humour and a spontaneous brilliancy as rare as they are delightful. 'A Stolen Mask' is a novel that stands high above the average, and can be strongly recommended. It is a long time since we have come across anything so thoroughly fresh and bright."—*Pall Mall Gazette.*

"A powerful and fascinating story."—*Daily Telegraph.*

"A novel of very remarkable originality, insight, and talent."—*Guardian.*

By FRANCIS GRIBBLE.

The Things that Matter.

Crown 8vo, cloth, 6*s.*

"Is an extremely clever psychological study."—*Times.*

"It is a very amusing novel, full of bright satire directed against the new woman, and similar objects."—*Speaker.*

"The book is extremely interesting, and brightly and swiftly told. . . . Full of crisp epigrams."—*Queen.*

By G. B. BURGIN.

The Judge of the Four Corners.

Crown 8vo, cloth, 6*s.*

"A delightfully humorous sketch, full of the purest fun, and irresistibly laughable." —*Saturday Review.*

"A tale which is well worth reading, and few who begin the idyll of 'Old Man' Evans and Miss Wilks will lay aside the book unfinished. . . . Instinct with humour, pathos, and a firm grasp of character."—*National Observer.*

"A more stirring and fascinating tale has not been told for many a day."—*Daily Telegraph.*

Recent Six-Shilling Novels—*continued.*

By Eden Phillpotts.

My Laughing Philosopher.

Illustrated by George Hutchinson. Crown 8vo, cloth, 6*s.*

"We commend to the notice of any one wanting a good laugh 'My Laughing Philosopher,' whose varied character sketches amply prove Mr. Eden Phillpotts to be endowed with those two excellent gifts of humour and imagination."—*Spectator.*

"The book will be welcome to every one who likes a book from which a man can get a good laugh."—*Scotsman.*

By Norma Lorimer.

A Sweet Disorder.

Crown 8vo, cloth, 6*s.*

"Has freshness, vivacity, variety of scene, some very good character-sketching, excellent dialogue, and plenty of epigram. . . . Ought to be a success."—*Literary World.*

"One feels quite safe in predicting a wide popularity for the book."—*Queen.*

By F. M. White.

The Robe of Lucifer.

Crown 8vo, cloth, 6*s.*

"Extravagant, whimsical, and delightfully ingenious."—*Manchester Guardian.*

"Undeniably ingenious—full of power and interest."—*Daily Telegraph.*

By Leslie Keith, Author of "The Chilcotes," "'Lisbeth," etc.

For Love of Prue.

Crown 8vo, cloth, 6*s.*

"Plot and incident in this present story are alike remarkable . . . altogether we heartily commend 'For Love of Prue' as a sensible, humorous, and thoroughly wholesome book."—*Speaker.*

"Some words of appreciative and cordial praise must be accorded to Leslie Keith's new story, 'For Love of Prue,' which is fresh and wholesome throughout, and teems with charming contrasts of pathos and humour."—*Daily Telegraph.*

By Dorothea Gerard.

Lot 13.

Crown 8vo, cloth, 6*s.*

"A bright, buoyant, and bustling story, with plenty of local colour derived from the scenery and the society, black and white, of a West Indian plantation." —*Times.*

"Delightfully fresh and original in plot, character, and incident, and it has the charm that Miss Gerard's work never lacks of an atmosphere of imagination and poetry."—*Guardian.*

By the late Mrs. J. K. Spender, Author of "Thirteen Doctors," etc.

The Wooing of Doris.

Crown 8vo, cloth, 6*s.*

"Has much to commend it to novel readers. A clever plot; well-drawn characters —such are the leading features of a novel by which the reputation of its much-regretted writer is fully sustained to the last."—*World.*

"A charming and wholesome story, it is full of human interest."—*Sheffield Daily Telegraph.*

SOME ILLUSTRATED ROMANCES.

By MAIDIE DICKSON.

The Saga of the Sea Swallow.

Illustrated by J. D. BATTEN and HILDA FAIRBAIRN. Foolscap 4to, cloth extra, gilt top, 4*s*. 6*d*. net.

"The narrative is told with the most engaging circumstantial vividness, and it held us as we read."—*Academy*.

By ROMA WHITE.

The Changeling of Brandlesome.

A Romance of Lancashire.

Illustrated by SYDNEY COWELL. Crown 8vo, cloth, 6*s*.

"An exciting romance, full of stirring deeds, and sparkling with clever effects."—*Leeds Mercury*.

By J. C. SNAITH.

Mistress Dorothy Marvin.

A Romance of the Glorious Revolution.

Illustrated by S. COWELL. Crown 8vo, buckram, 6*s*.

"The author has succeeded in making his story intensely interesting. . . . One of the very best adventure stories we have had for a long time past."—*Speaker*.

"'Mistress Dorothy Marvin,' most delightful and winsome of women, and one of the freshest and most unhackneyed heroines whose acquaintance we have had the pleasure of making for a very considerable period. . . . Mr. Snaith has a great gift of observation, and his book is a remarkable picture of the age it is intended to depict."—*World*.

By STANLEY WEYMAN.

My Lady Rotha.

A Romance of the Thirty Years' War.

Illustrated by JOHN WILLIAMSON. Crown 8vo, buckram, 6*s*.

"No one who begins will lay it down before the end, it is so extremely well carried on from adventure to adventure."—*Saturday Review*.

By FRANK BARRETT, Author of "The Admirable Lady Biddy Fane."

A Set of Rogues.

A Romance of the Seventeenth Century.

Illustrated by S. COWELL. Crown 8vo, buckram, 6*s*.

"He has related the adventures of a set of rogues . . . with so pleasant a tongue and in such attractive fashion that it is impossible for mere flesh and blood to resist them. His set of rogues have won our entire sympathy, and his narrative our hearty approval."—*Pall Mall Gazette*.

"Another capital story. . . . Strongly recommended. Stirring tale this, without a dull chapter in it, and just enough human sentiment in it to soften down the roguery. . . . Let the honest reader procure the book."—*Punch*.

SCARLET NOVELS.

A SERIES OF POPULAR NOVELS BY WELL-KNOWN AUTHORS.

Crown 8vo, uniform scarlet cloth, 3s. 6d. each Volume.

ANTHONY HOPE'S SOCIETY NOVELS.

Comedies of Courtship.

"He is undeniably gay in the best sense of the word, now and then almost rollicking. An admirable example of what we mean by gaiety in fictional literature." —*Daily Telegraph.*

Half a Hero.

"The book is delightful to read, and an excellent piece of work."—*Standard.*

Mr. Witt's Widow.

"A brilliant little tale. . . . Exhibits unborrowed ingenuity, plausibility, and fertility in surprises."—*Times.*

By MAX PEMBERTON.

A Gentleman's Gentleman.

"This is very much the best book that Mr. Max Pemberton has so far given us." —*Daily Chronicle.*

By RICHARD PRYCE.

The Burden of a Woman.

"The conception and execution of this interesting story are excellent. A book to read and remember with pleasure."—*Lady's Pictorial.*

By C. R. COLERIDGE.

Amethyst.

"Extremely amusing, interesting, and brightly written."—*Guardian.*

By F. FRANKFORT MOORE.

Two in the Bush and Others Elsewhere.

"Carry the reader on from page to page till criticism is forgotten in enjoyment." —*Daily Graphic.*

By ROMA WHITE.

Punchinello's Romance.

Crown 8vo, cloth, 3*s.* 6*d.*

"We give Roma White the warmest of welcomes into the world of fiction. . . . Admirably and irresistibly comic, without anything in the nature of force or even of apparent exaggeration, ready at the least moment to run into equally true pathos." —*Graphic.*